MESTA

MM

PLANT AND PRODUCT

OF THE

MESTA MACHINE COMPANY

PITTSBURGH, PENNSYLVANIA

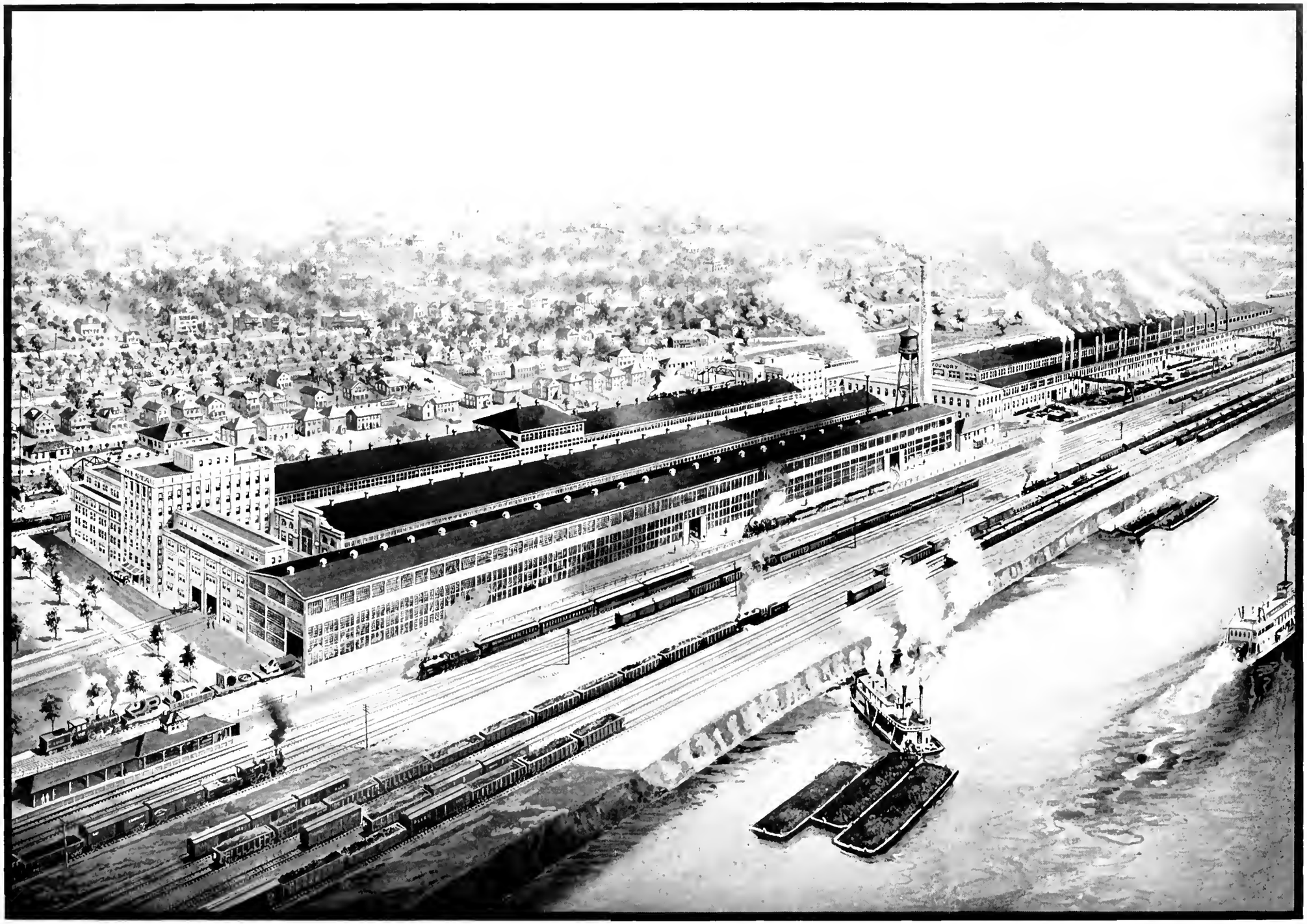
U. S. A.

General Office and Works: West Homestead, Pennsylvania

Pittsburgh Office: Oliver Building

Cable Address:
Mesta, Pittsburgh

Codes:
Western Union, Universal Edition
and Five Letter Edition



General Office and Works of the Mesta Machine Company, West Homestead, Pennsylvania, U. S. A.

INTRODUCTION

WITHIN the pages of this book may be found a brief description and some illustrations of the plant and product of the Mesta Machine Company, who for a number of years have been designers and builders of machinery used in the iron and steel industry.

The plant of the Mesta Machine Company is located in West Homestead, Pennsylvania, on the Monongahela River, about six miles from the business center of Pittsburgh, the greatest iron and steel manufacturing district in the world, thus occupying an ideal location for a works of its kind.

The plant covers more than twenty acres, all of which are occupied by buildings, yards and equipment. The Company employs about three thousand workmen, most of whom are skilled mechanics. The buildings, consisting of General Office Building, Machine Shops, Forge Shops, Pattern Shop, Pattern Storage Buildings, Laboratories, Iron Foundry, Steel Foundry and Brass Foundry, are of fireproof construction.

The plant and equipment are so arranged that all machinery is built complete within the plant from the raw materials. The only limit as to size and weight of machinery built is that which the railroads can handle. Steel and iron castings weighing over one hundred tons have been made in the foundries and finished in the machine shops.

The Mesta Machine Company builds a more complete line of heavy machinery for iron and steel works than any other company in the United States. This line consists of Gas and Steam Blowing Engines for blast furnaces, Gas and Steam Engines for rolling mills and power plants, Rolling Mills, Forging Presses, Shears, etc., Cut and Machine-Molded Gears and Rolling Mill Pinions and all the various kinds of rolls used in rolling mills.

Mesta machinery can be seen in all of the large iron and steel plants, and in many of the power plants, in the United States. They have also furnished some of the largest machinery used in the United States Government Steel Plants. Their product can also be seen in many of the iron and steel plants in Canada, Australia, India, England, France, Italy and Japan.

As it is impossible to describe and illustrate all of the products of the Company in this book and as the engineering departments are constantly working on improvements and new designs, bulletins are issued from time to time. These bulletins describe and illustrate such improvements and new designs, and will be sent upon application.

Mesta Station, Pennsylvania Railroad, West Homestead, Pa.

THE General Office and Works of the Mesta Machine Company, being located at West Homestead, Pennsylvania, a suburb of Pittsburgh, are very easy of access, both from the business center of Pittsburgh and from the residence section.

Mesta Station, on the Monongahela Division of the Pennsylvania Railroad, is shown in the illustration above, which also shows the overhead bridge leading from the station and street to one of the entrances of the General Office Building. The distance from Pennsylvania Station, Pittsburgh, to Mesta Station is about six miles. There are a number of trains each way daily and the trip requires about twenty minutes.

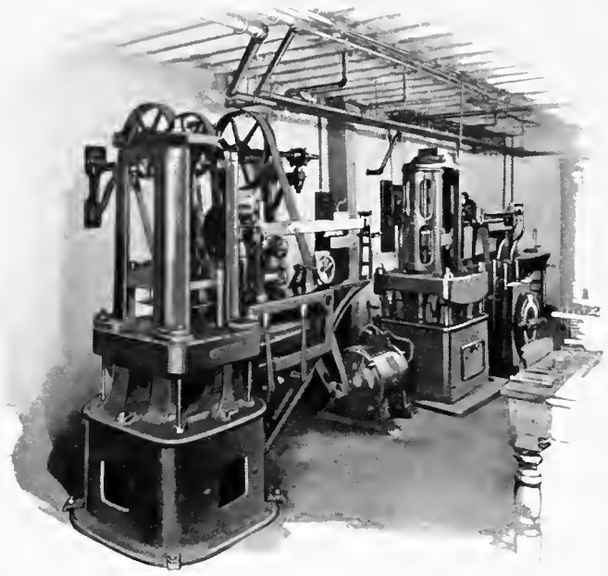
The Pittsburgh business center and residence district can also be reached by an electric street railway, which passes near the end of the overhead bridge. The building in the background is the Company garage.

General Office Building of the Mesta Machine Company, West Homestead, Pa.

THE Mesta Machine Company's General Office is located at the northeast end of the Plant. The building is of fireproof construction, being built of steel, brick and concrete.

The driveway entrance is located in the center of the main building. The footwalk entrance is located on the Pennsylvania Railroad side and is reached by means of an overhead bridge. The bridge entrance is on the third floor, on which are located all the executive offices of the Company.

The first and second floors are occupied by the Works Management. The fourth floor is occupied by the Sales Department, and the fifth and sixth floors by the Engineering and Drafting Departments. The seventh floor is entirely devoted to an up-to-date kitchen and dining rooms, one dining room being used for the general office employees, one for the heads of departments and one for the use of visitors.



Testing Machines in Physical Laboratory

LABORATORIES

THE first important step in the manufacture of high grade machinery is the chemical analysis of raw materials that are converted into castings and forgings used in manufacturing such machinery. The Chemical Laboratory of the Mesta Machine Company is provided with the most modern equipment for making analyses by the latest methods.

The Physical Laboratory is equipped with two testing machines, each having a capacity of 100,000 pounds for determining the physical properties of the materials. This department is of vital importance to the successful manufacture of machinery such as produced by this Company, where, in almost every instance, the question of working stresses with respect to strength of materials must be given careful consideration.

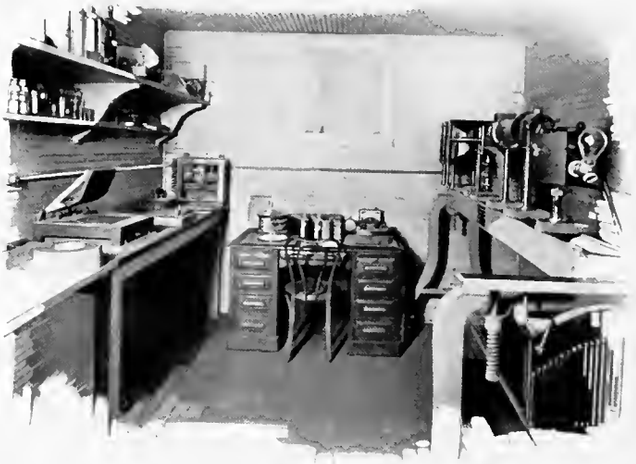
While scientific investigation in the form of chemical and physical analyses is of great importance, none the less important, however, is the Microphotographic Department for studying the structure of materials and assisting in the solution of metallurgical problems that cannot be solved by the Chemical or Physical Laboratories alone.

Important among such tests may be mentioned the examination for inclusions of slag, oxides, etc., which have a tendency to weaken the materials so affected.

While the Melting Departments are dependent almost entirely on the Chemical Laboratory for the proper selection of raw materials, the Annealing and Heat Treating Departments are dependent upon the Physical Laboratory and Microphotographic Department to show the results accomplished with respect to the physical properties and the transformation in the structure of materials.

All tests are carefully recorded and properly indexed, so that ready reference may be made when necessary.

All grades of raw materials used are analyzed in the Chemical Laboratory

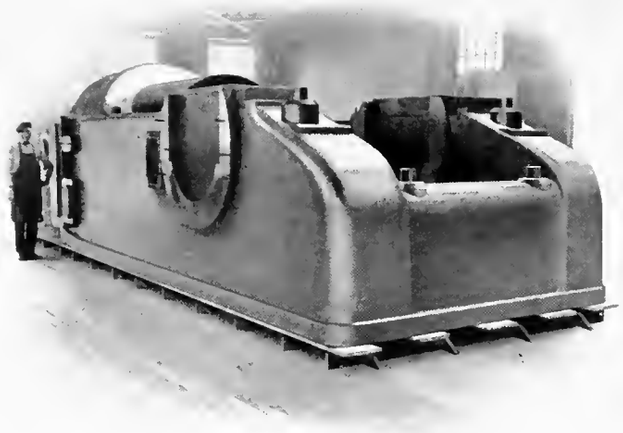


Microphotographic Department

View in Chemical Laboratory

as soon as received. Charts are prepared showing the exact location in the metal yards of the various grades of raw materials, so that in making up a heat the proper proportions of selected stock are used.

Each and every air furnace iron melt, brass melt and open hearth steel melt is analyzed and a permanent record kept of same. Likewise physical, and where necessary micrographical determinations are made of the castings and forgings produced from such melts. These analyses are made in the Mesta Laboratories, which are provided, not only with the most modern chemical equipment, but also with electric combustion furnaces for making determinations with the highest degree of accuracy. In this manner the quality of materials entering into the machinery manufactured by this Company is carefully guarded from the raw material to the finished product.



Large Gas Engine Bedplate Pattern

PATTERN DEPARTMENT

ONE of the important departments in a manufacturing plant producing castings of iron, steel and brass is the Pattern Department. The Mesta Machine Company is particularly well equipped in this respect, having a large two-story, fireproof Pattern Department constructed of steel and concrete, directly adjoining the foundries.

By having the pattern department adjoining the foundries affords a close co-operation between these departments and such co-operation results in a considerable saving of time in the delivery of castings. Furthermore, the return of patterns to the pattern department for changes from right to left-hand, or other alterations that may be necessary, can be done in the shortest possible time. Since all these changes are made in the Pattern Department where the work is done to better advantage, the foundry space is relieved that would otherwise be taken up by the patterns while this work is being done.

The wood-working machinery is of the most modern type, individually motor driven and properly safeguarded to protect the workmen. An exhaust system is used to remove the wood cuttings and sawdust.

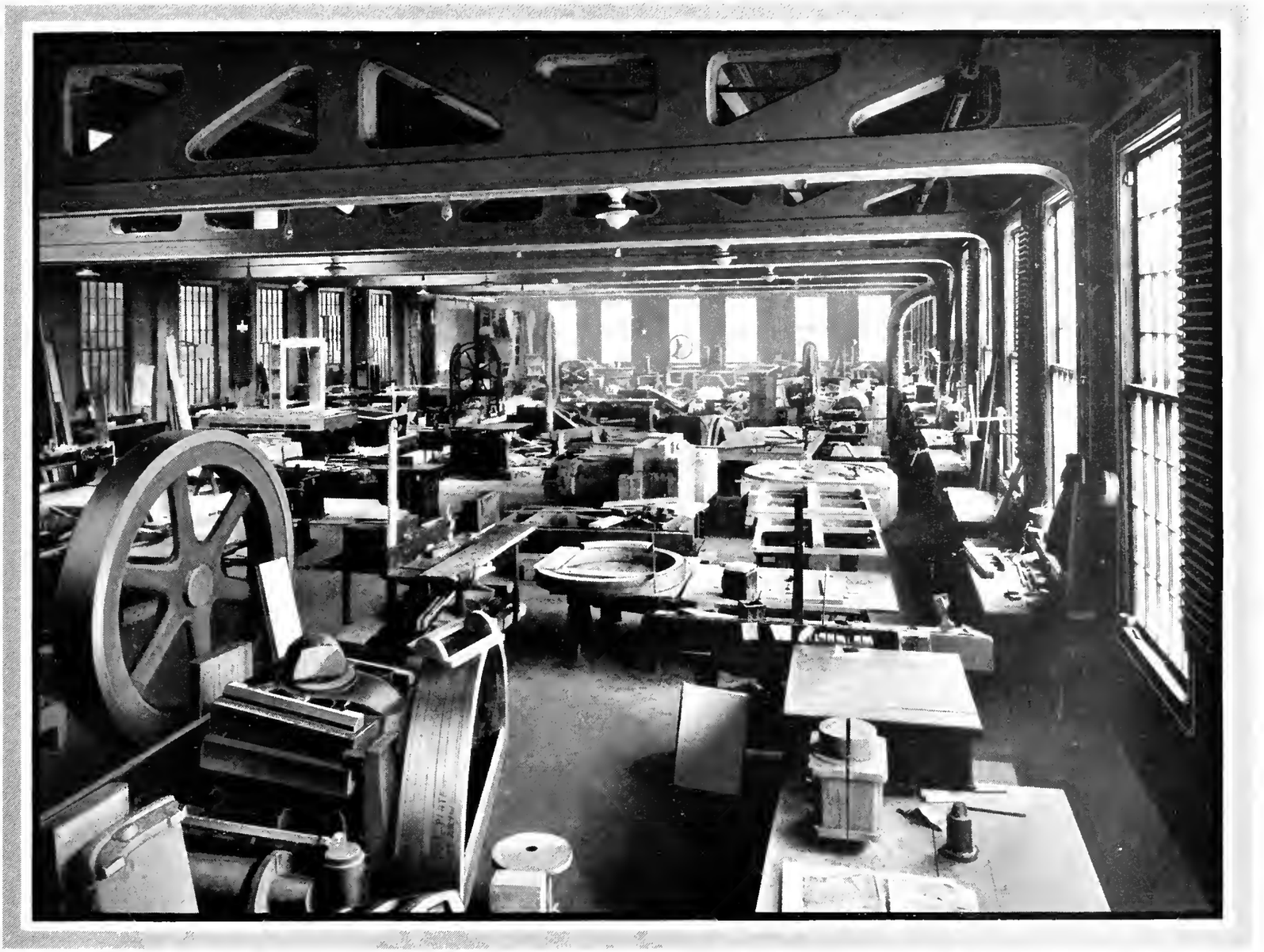
The first floor of the Pattern Department is devoted principally to the manufacture of tooth blocks and other pattern equipment necessary in connection with machine molding of gears and mill pinions and to the repairing and altering of existing patterns.

The lumber from which patterns are made is selected with the utmost care, and well-seasoned in steam-heated kilns, in order that there will be no shrinkage in the finished pattern, and thus no longer represent the true size and shape of the part to be cast.

All patterns from which a mold has been made pass through the Pattern Shop for inspection and repairs where necessary before being used again. This is also the case with patterns shipped in by customers who wish to have castings made from their own patterns.

Adjacent to the foundries are several large fireproof buildings for the storage of patterns when not in use.

General View on First Floor of Pattern Department



General View on Second Floor of Pattern Department

The above illustration shows the second floor of the Pattern Department. It will be noticed that the roof trusses and the roof, which are of steel construction, are heavily covered with concrete in order to make it absolutely fireproof. Besides the side lights there is a large skylight under which large patterns, such as engine bedplates, mill housings, etc., are built.

In order to avoid the inconvenience that would be encountered if large patterns made on the second floor had to be transferred to the first floor, a platform is provided in the foundry on a level with the second floor. All patterns made on the second floor are moved onto this platform from which they are carried by the foundry cranes to the place where they are to be used.

The basement of the Pattern Department is used for the storage of supplies for the Pattern Department and Foundries.

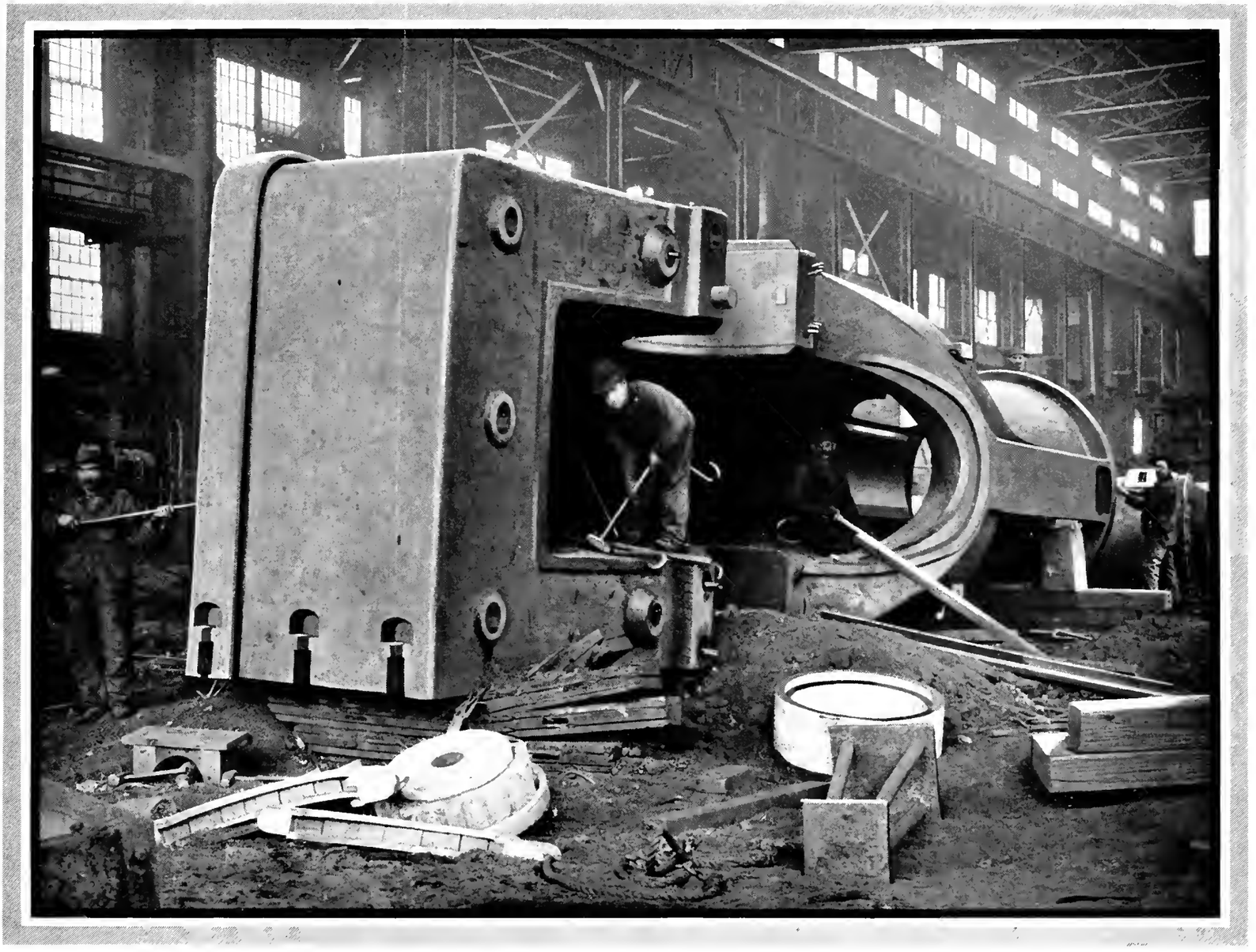
View of Main Aisle in Foundry Department

FOUNDRY DEPARTMENT

THE Foundry Department of the Mesta Machine Company is one of the largest in the United States and is especially equipped for the manufacture of the iron, steel and bronze castings which are required for the heavy class of machinery manufactured by this Company.

The main aisle as shown in the above illustration is 80 feet wide and 1200 feet long, with aisles on both sides 60 feet wide extending the full length of the main aisle. The Brass Foundry and all of the melting furnaces are located in the side aisle to the right. The molding floor for small castings, core department, gear molding department and drying ovens are located in the side aisle to the left.

This Department is served by overhead electric traveling cranes ranging in capacity from 10 to 100 tons. There are also a number of side cranes used for carrying and setting the cores.

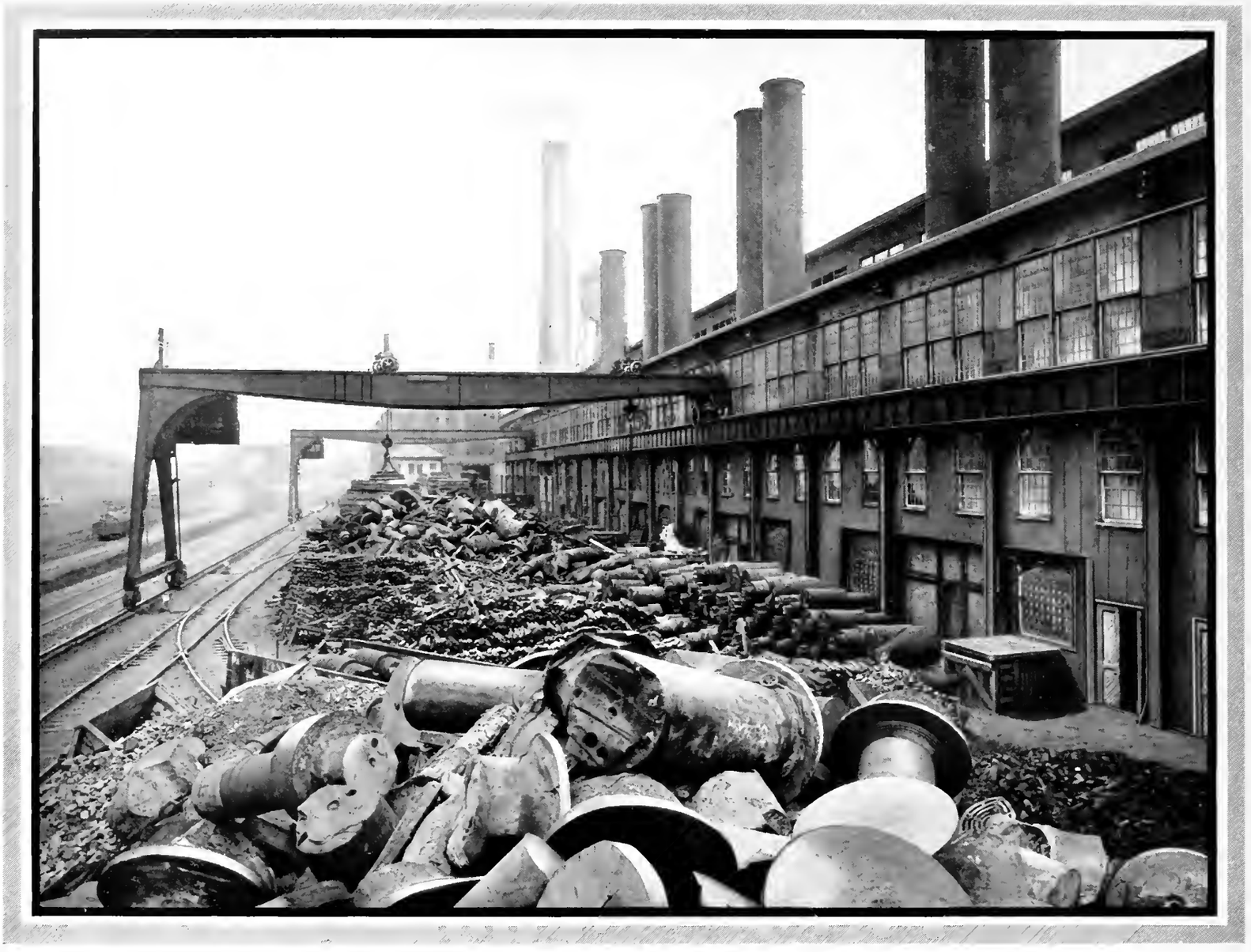


Gas Engine Bed Plate Casting. Weight, 90 Tons

IRON FOUNDRY

IN the main aisle of the Iron Foundry, castings are made from medium size up to 125 tons. For making these large castings special equipment is required. Large reinforced concrete pits are built in the floor of the foundry in which the molds are made. The object of the concrete pits is to prevent the heavy pressure of metal from spreading the mold. Arrangements are also made for securely bolting the cope to the top of the mold. These molds, when completed, are dried in place by natural gas.

The next important step in successfully making large iron castings is to have the iron melted in air furnaces. The Mesta Machine Company make all of their medium size and large castings of iron melted in seven air furnaces, which have a combined capacity of 200 tons, and therefore are able, if necessary, to tap 200 tons of molten iron of the same analysis and of practically the same temperature at the same time.



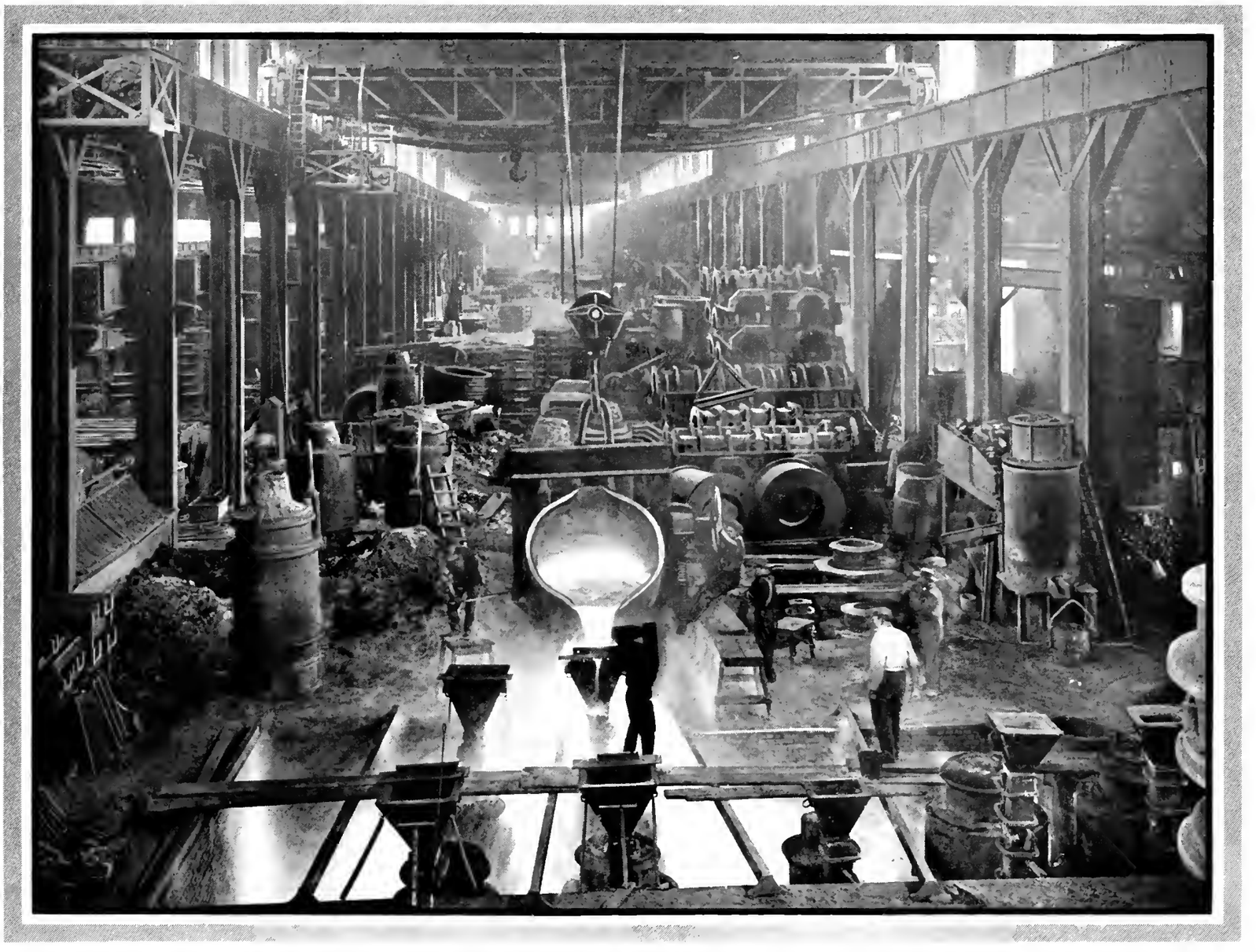
View in Metal Yard

METAL STORE YARD

THE Metal Store Yard is 85 feet in width and 1200 feet in length and is served by four Gantry Electric Traveling Cranes. In this yard all pig iron and scrap for both the iron and steel departments are stored. All of the materials, excepting the very heavy pieces of scrap, are unloaded from the cars to the yard by these cranes with the use of electric magnets.

About one-half of this yard, or that which is shown in the above illustration, is used for storing the different grades of pig iron and scrap used for making iron castings and iron rolls. The other end of the yard is used for storing pig iron and steel scrap to be used in the Open Hearth Steel Department for making steel castings, steel rolls and forging ingots.

The seven Air Furnaces, which are also shown in the above illustration, are charged from the yard side by the overhead cranes.



View in Roll Foundry

ROLL FOUNDRY

THE Roll Foundry of the Mesta Machine Company is the largest individual foundry in the United States for the manufacture of iron and steel rolls, from the largest to the smallest, and of all classes required in the rolling mill industry.

The iron for all chilled and sand cast rolls is melted in seven air furnaces, ranging from 15 to 40 tons capacity. A number of overhead electric traveling cranes, varying in size from 30 tons up to 100 tons, operate in this department. The foundry is provided with the most modern equipment of flasks and chills, and also large concrete pits in which the molds and chills are placed to be poured. Some of these pits which are used for casting the largest rolls are 30 feet in depth. The material used for making steel rolls and Mesta Special Rolls is made in four acid open hearth furnaces, which range in capacity from 40 tons to 50 tons.

View Showing Charging Side of Open Hearth Furnaces

OPEN HEARTH STEEL DEPARTMENT

THE Open Hearth Steel Department has two 50-ton and two 40-ton Acid Open Hearth Furnaces. The charging floor of the furnaces is on the same level as the yard, where all the pig iron and melting scrap is stored. This material in the yard is placed in charging boxes by means of overhead electric traveling cranes provided with electric magnets. These boxes, which are mounted on small cars, are moved from the yard store to the charging floor in front of the furnace by an electric locomotive, and the furnaces charged by an electric charging machine. The furnaces and other equipment are the most modern and up-to-date used in making steel.

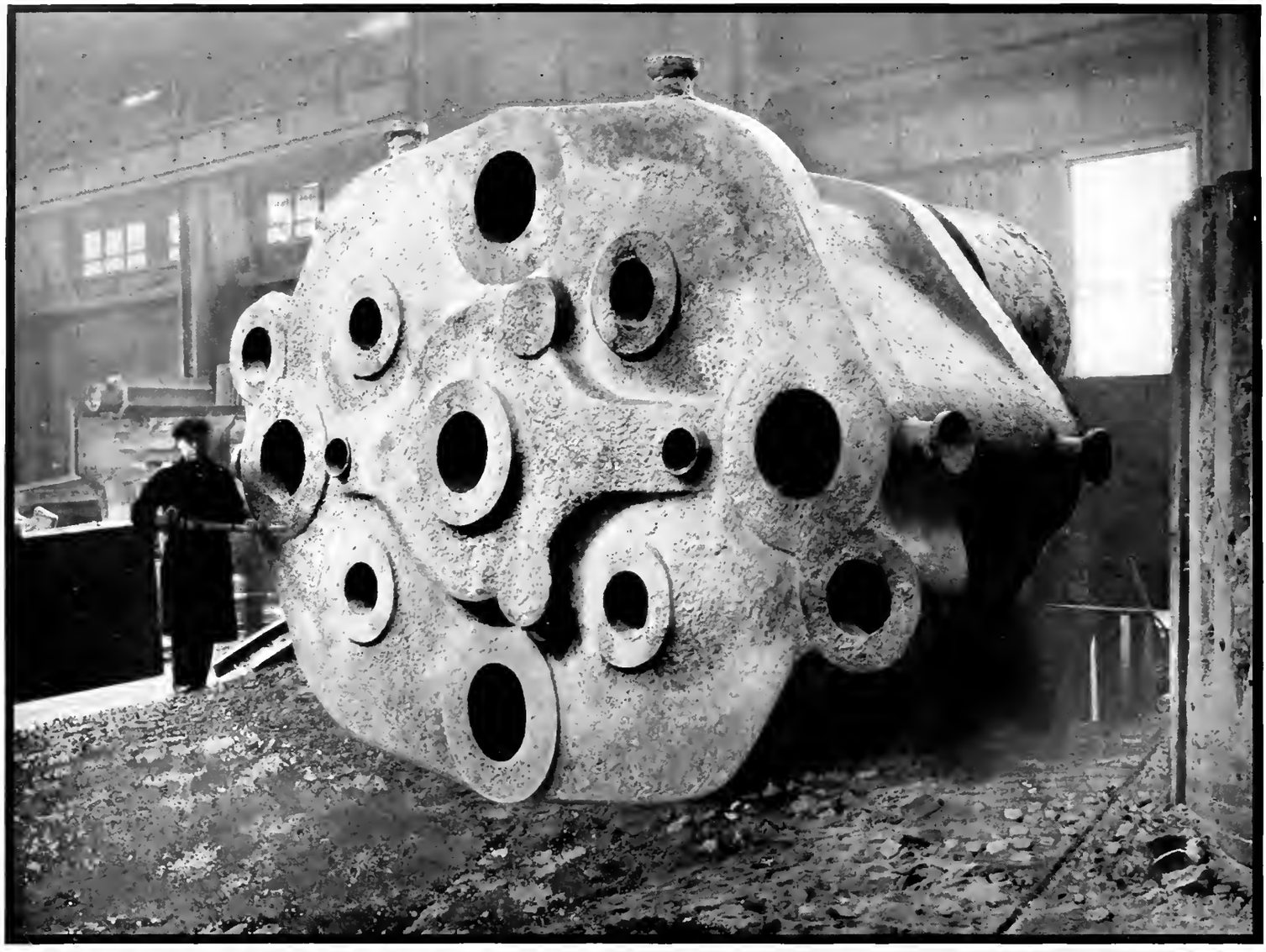
The fuel used is natural gas, which is obtained from a number of wells located near the plant, and controlled by the Mesta Machine Company. The furnaces are also equipped with oil burners to be used in case of emergency.

View in Steel Foundry

STEEL FOUNDRY

ON account of the class of machinery built by the Mesta Machine Company, it is necessary for them to have a steel foundry in which not only the highest quality of castings are made, but also the largest castings that are used in building such machinery. The four Acid Open Hearth Furnaces, which are illustrated and described on the opposite page, make the steel used in this foundry.

The main aisle of the steel foundry is equipped with cranes ranging in capacity from 30 to 100 tons; also with traveling side cranes, which are principally used for handling cores. The drying ovens, which are in the 60-foot building adjoining the main building, are of the most modern type, having the furnaces, which are fired with coke, built under the ovens. The proper drying of the molds and cores is a very important part of the work in a steel foundry.



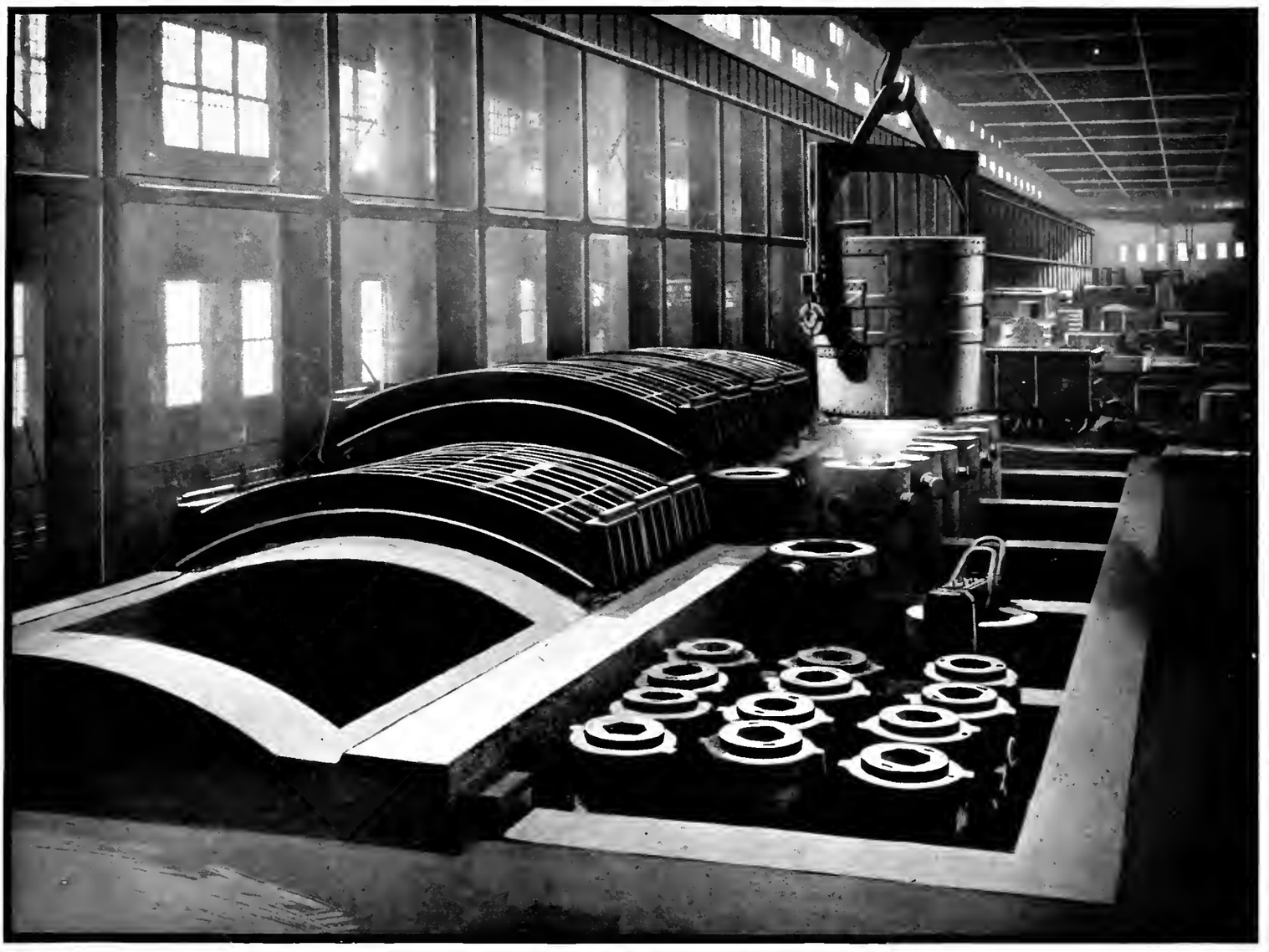
Steel Casting on Cleaning Floor. Weight, 120 Tons

The Steel Foundry of the Mesta Machine Company is equipped for making steel castings up to 125 tons. To make such a casting requires about 180 tons of molten steel to pour the mold, as about 30% of the weight is required for gates and sinkheads. With four open hearth steel furnaces this amount of steel can be tapped into ladles at the same time.

The molds for the heavy castings are molded in large reinforced concrete pits in the foundry floor, to prevent the molds from spreading. These molds are dried in place by natural gas.

The Cleaning and Chipping Floor is located at one end of the main aisle of the Steel Foundry, so that the heavy steel castings are not transferred into another building for chipping and cleaning.

One of the important steps in making steel castings, especially those of heavy weight or large dimensions, is

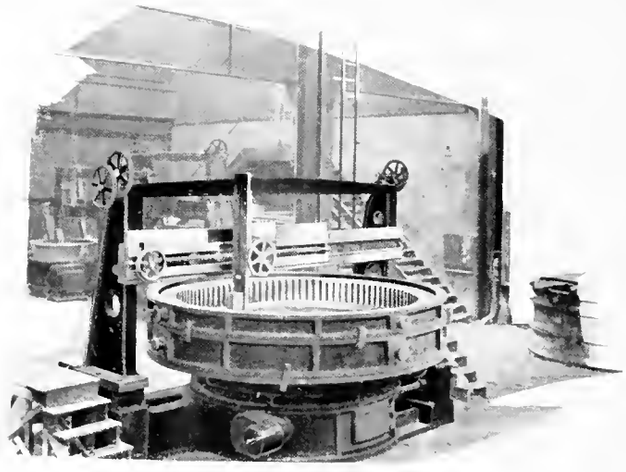


Annealing Furnaces and Ingot Casting Pits

the annealing process. It is not practical to anneal large castings such as shown on the opposite page by the usual methods where castings are placed on a buggy and moved into an annealing furnace.

The Mesta Machine Company have specially designed pit annealing furnaces. The cast steel covers, which are lined with firebrick, can be removed, as shown in the above illustration. As these annealing furnaces are located in the end of the Chipping Floor, the castings can be placed in the annealing furnaces by the overhead traveling cranes with the greatest ease.

The pits, where forging ingots are cast, are also shown above. This is where carbon steel, nickel steel and other alloy steel ingots are cast for the Mesta Forge Department. This Company also supplies Forging Ingots to other manufacturers of forgings who do not have a steel-making department.



Machine Molding a 12-Foot Gear

GEAR MOLDING DEPARTMENT

GEARS made by the old method, from wood patterns, are inaccurate and should not be used in modern machinery.

The Gear Molding Department of the Mesta Machine Company is equipped with their Patented Gear Molding Machines, on which spur gears, double helical gears, bevel gears, mitre gears and other classes of gears are molded.

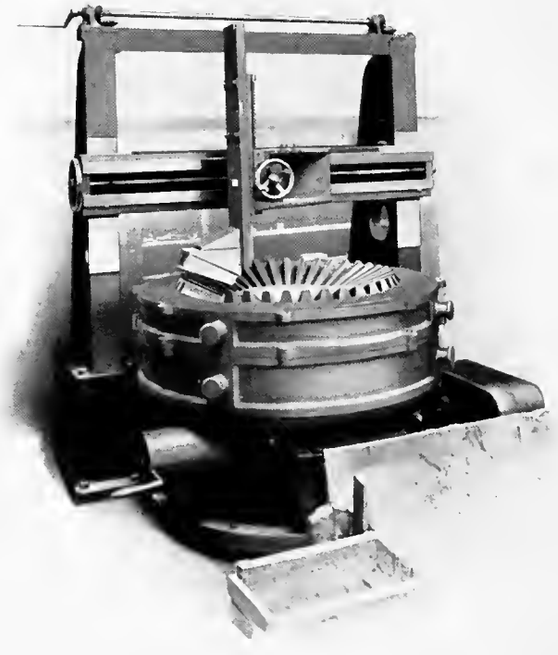
These machines are vastly different from all other types of gear molding machines. The flask, in which the mold is made, revolves with the table. The head, to which the tooth block is bolted, moves on a heavy cross-rail. The cross-rail is also movable vertically, being supported by two heavy housings, so that gears of different widths of face can be made. A gear of large or small diameter can be molded with equal accuracy, as the dividing mechanism on these machines is as accurate as on a gear cutting machine.

The tooth block or mold which forms the tooth is either made of metal or of hardwood that will not change its shape.

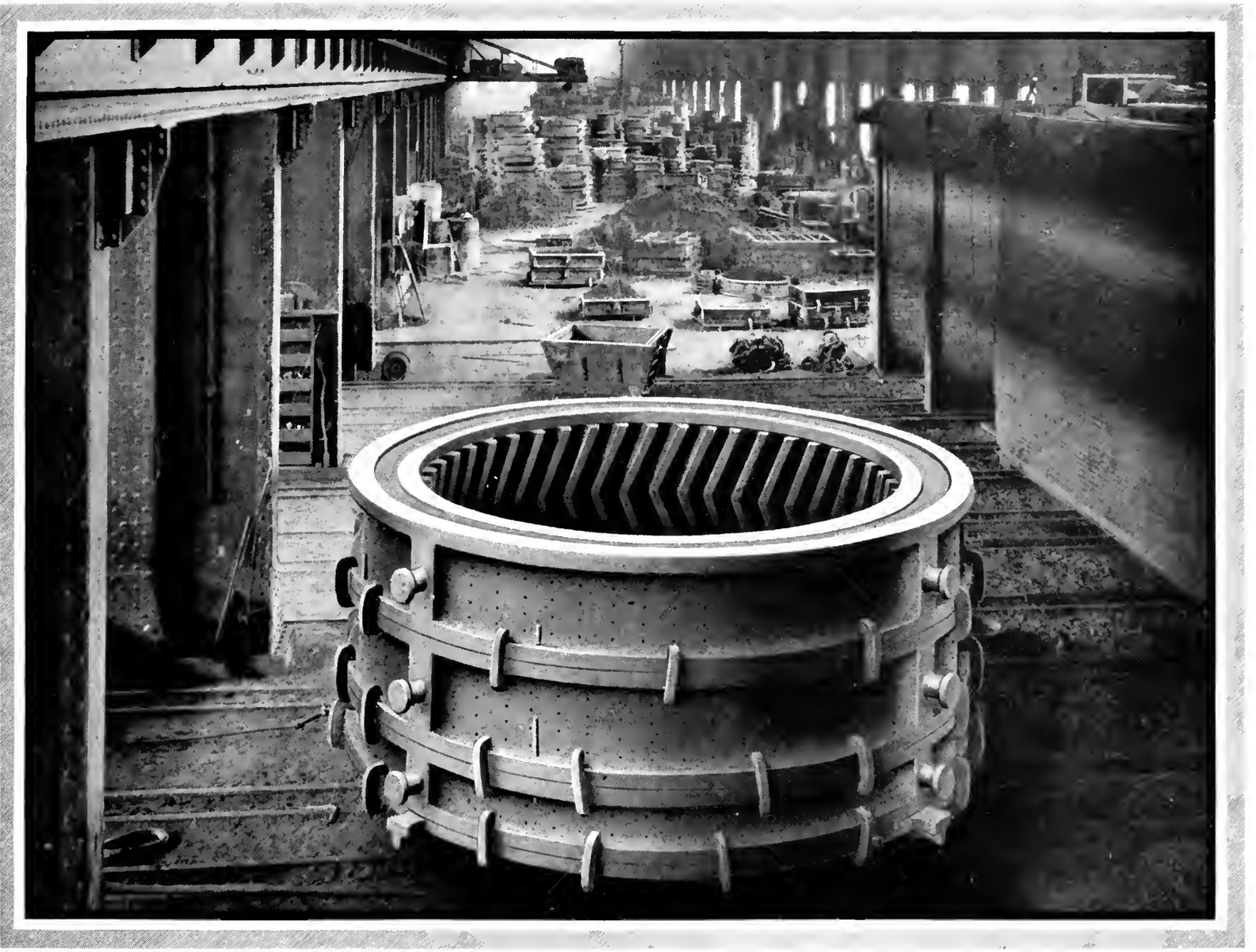
In making spur gears, the tooth block can be made parallel, that is, no taper is needed, as is necessary in a pattern-made gear, where the tooth must have sufficient taper in order to get the pattern out of the sand. After a tooth is molded, the tooth block is drawn back radially from the mold. The table and flask are then revolved through an angle corresponding to the pitch of the gear and the tooth block brought back into position again.

Another distinct advantage is that every tooth in the gear is molded from the same tooth block or form; therefore, all the teeth are alike in shape and size.

The Gear Molding Department of the Mesta Machine Company is equipped with four gear molding machines.



Machine Molding a Bevel Gear



Gear Molding Department

These machines are patented and built by them.

The gears are molded in heavy cast steel circular flasks. After the molds have been made on these machines they are placed in drying ovens, which are located at one end of the department, and thoroughly dried.

These ovens also are of the most modern type, and have furnaces which are fired with coke built under the ovens. The molds are then taken from the ovens and the cores, which form the center of the gear, are placed in the mold, which is then ready to receive the iron or steel from which the gear is to be made.

This method of making gears not only has the advantage of making gears that are much more accurate than can be made from any pattern, but also a considerable saving is effected in pattern cost and storage required for such pattern equipment.

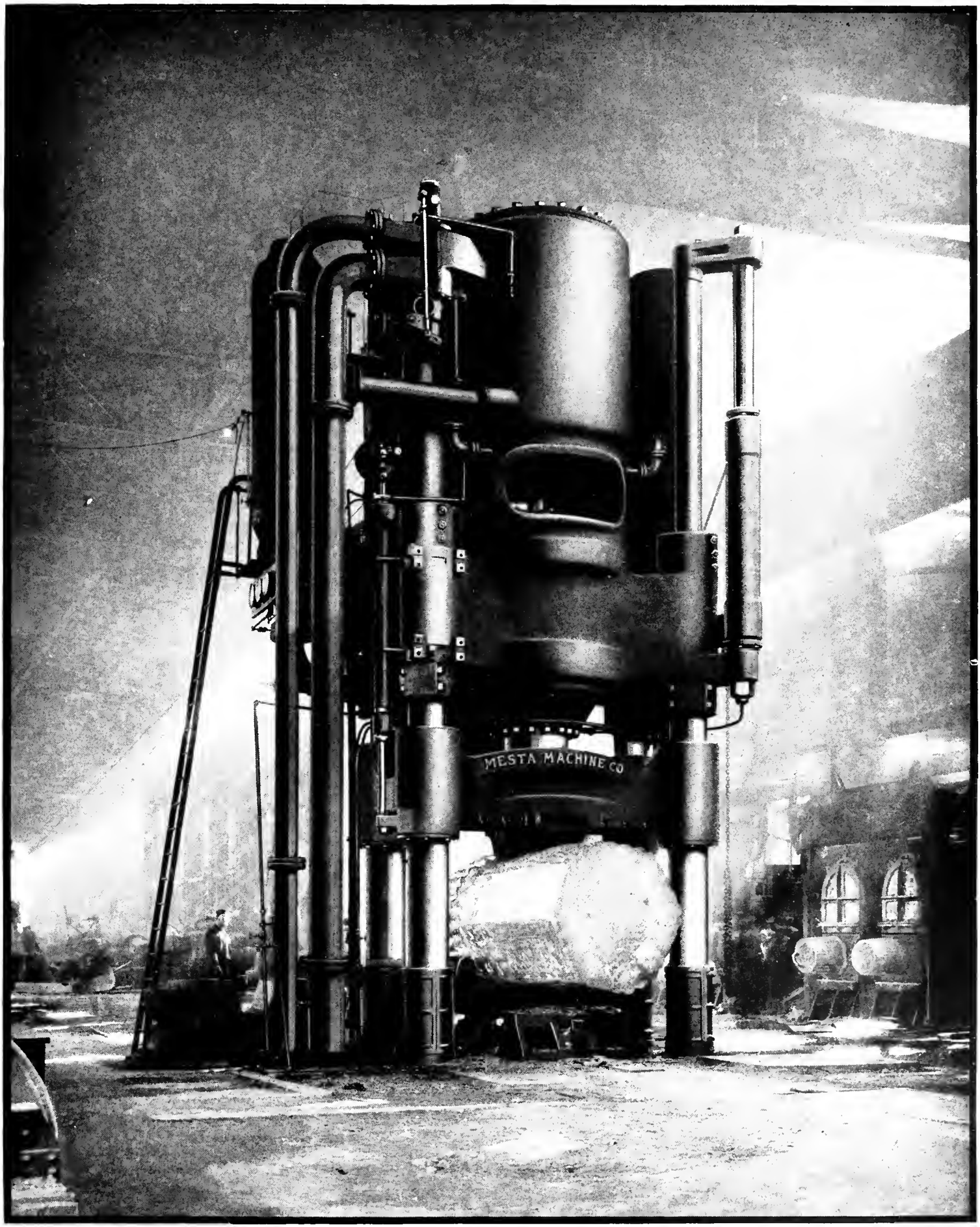
Forge Department No. 2, Showing Two 1500-Ton Steam Hydraulic Forging Presses

FORGE DEPARTMENT

TO successfully build heavy machinery, such as used in iron and steel works, it is important to have a large Forge Department, so that forgings of the proper quality can be obtained.

The Forge Plant of the Mesta Machine Company consists of three forge departments. Department No. 1 is equipped with hand forges and small steam hammers. Department No. 2 is equipped with two 1500-ton Steam Hydraulic Forging Presses, and Department No. 3 is equipped with one 1000-ton and one 2000-ton Steam Hydraulic Forging Press.

All of the Steam Hydraulic Forging Presses used have special patented features and are only built for the United States and Canada by the Mesta Machine Company. Departments Nos. 2 and 3 are equipped with special annealing and heat-treating furnaces and quenching tanks.



Forge Department No. 3, Showing 2000-Ton Steam Hydraulic Forging Press

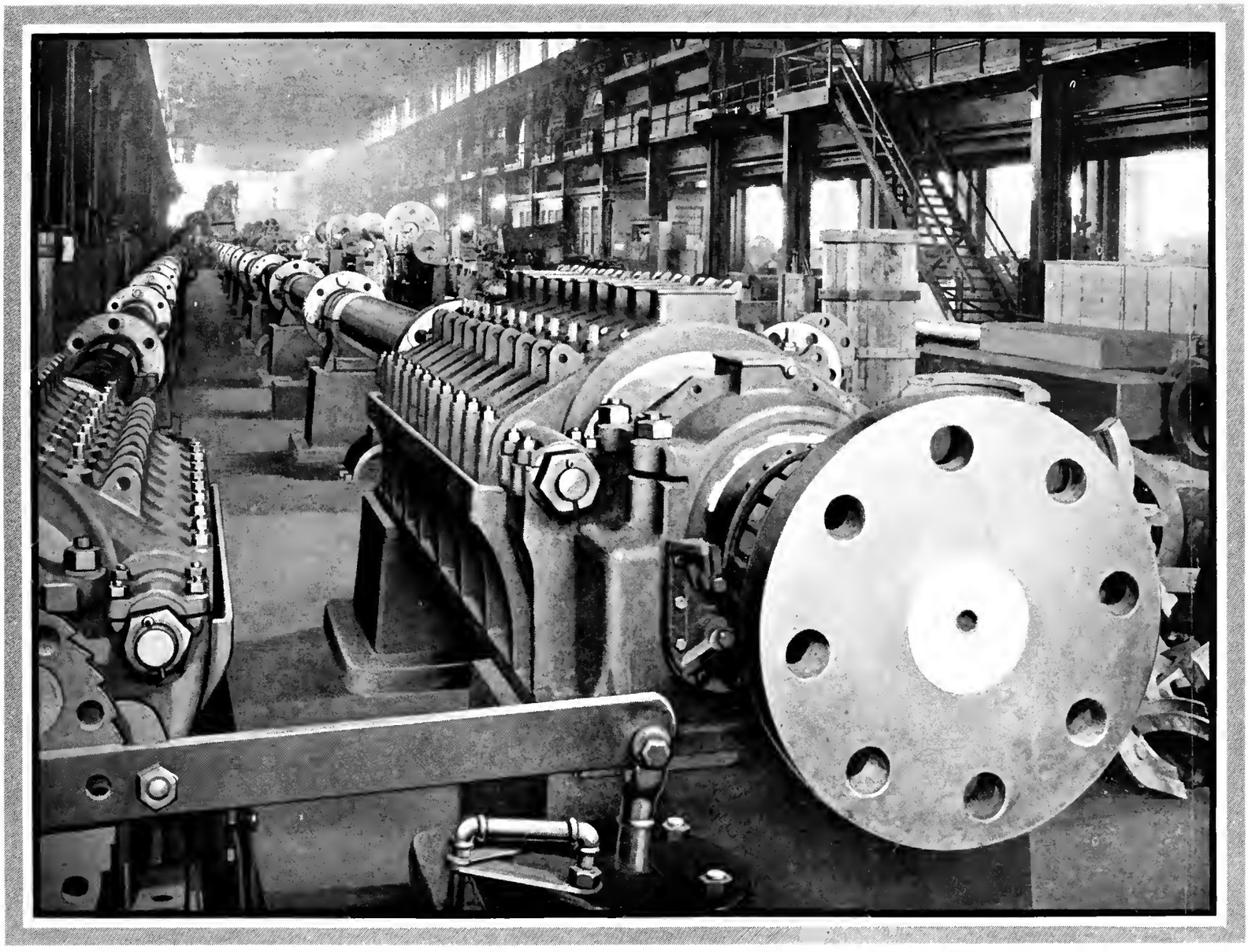
View in Ship Shaft Turning Department

SHIP SHAFT DEPARTMENT

A DEPARTMENT for manufacturing ship shafts, castings and other parts used in shipbuilding was added to the plant of the Mesta Machine Company during the late war when the United States Government was in very urgent need of such material. This department is equipped to manufacture complete from the raw materials to the finished product.

The work starts in the acid open hearth steel department where the forging ingots are made. The ingots are taken to the forge department, illustrated on page 22, where the forgings are made. The forgings then go to the heat-treating plant where they are heat treated and tested before going to the finishing department, which is equipped with the heaviest class of motor-driven machine tools.

After being machined the forgings and other parts go to the assembling department where the whole line shaft

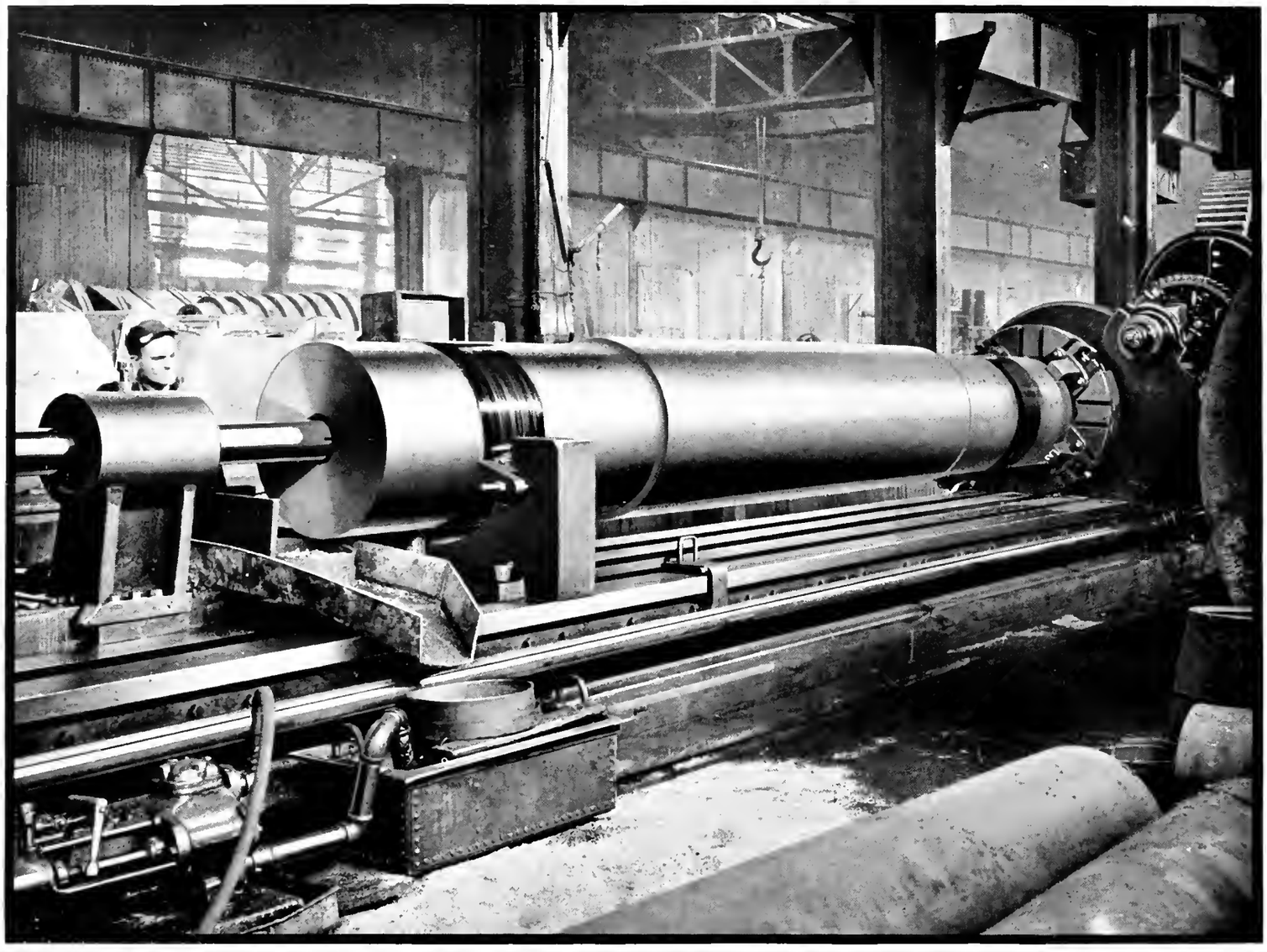


Assembling Floor in Ship Shaft Department

is completely assembled. Permanent pedestals accurately aligned and leveled are provided, so that the shafting can be set up in its own bearings to have the bolt holes through the flanges reamed.

The finishing and assembling of these shafts is so accurately done that the maximum variation throughout the entire length does not exceed 3/1000ths of an inch plus or minus. Such accuracy is particularly necessary where turbines are used for power. The shafting and other parts being thus finished and assembled can be installed in the ship without any further fitting at the shipbuilder's plant.

This Company received the contracts for the complete shafting, etc., for the first 180 ships built at the Hog Island plant of the United States Shipping Board; also similar contracts from many of the other large shipbuilding plants.



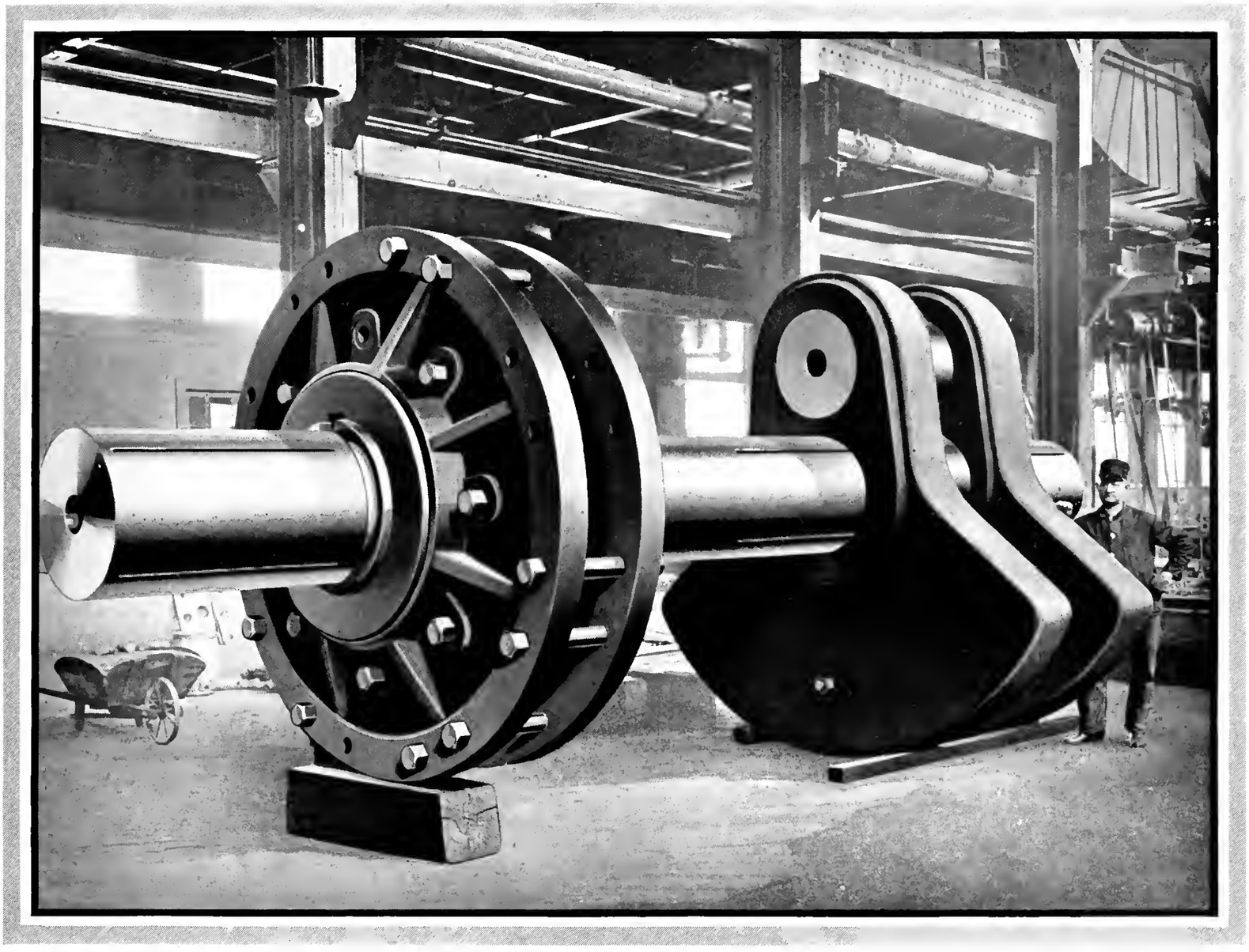
Machining Engine Shaft 32 Inches in Diameter

The Mesta Machine Company can forge in their No. 3 Forge Shop the largest shafts that are used in building engines and rolling mill machinery for iron and steel plants.

The department for finishing these forgings is equipped with heavy tools. This department is also provided with heavy boring lathes for boring holes through large shafts, as it is very important to know if there are any defects in the center of the shaft, which can only be ascertained by boring a hole through the entire length of the shaft.

In making piston rods for large gas and steam engines, it is not only necessary to have them hollow bored to discover any invisible defects, but also to reduce the weight. In making these piston rods, they are rough machined and bored, and after being heat treated and tested are put into the finishing lathes and the exterior surface finished.

In building certain types of large

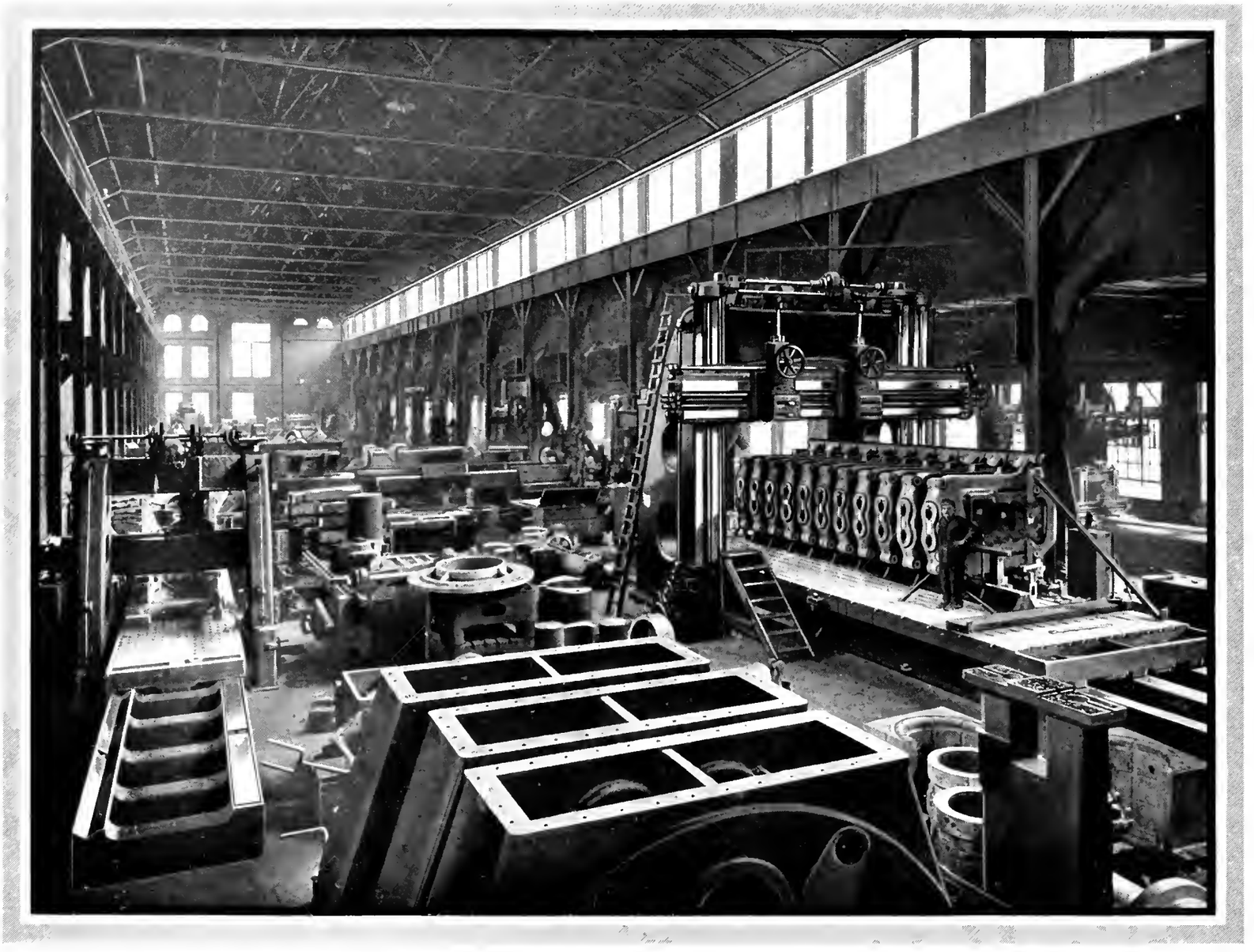


Large Built-up Engine Crank Shaft

engines, such as Reversing Engines and Gas Engines, it is necessary to use center crank shafts.

Some years ago only solid forged shafts were used in engines of this type, but in more recent years the built-up shaft came into use. The Mesta Machine Company for a number of years has carefully watched the failures of shafts of the solid type and has come to the conclusion that the built-up shaft is much safer than crank shafts made from a solid forging.

The advantages of the built-up shaft are, that the forgings for the shaft and the crank pin are forged separately, and therefore, more reliable than a forging for a solid crank shaft; the balance weights can be cast with the crank webs instead of keyed on; the machine work on the different parts of the built-up shaft can also be done more accurately than it can be done on a solid forged shaft.



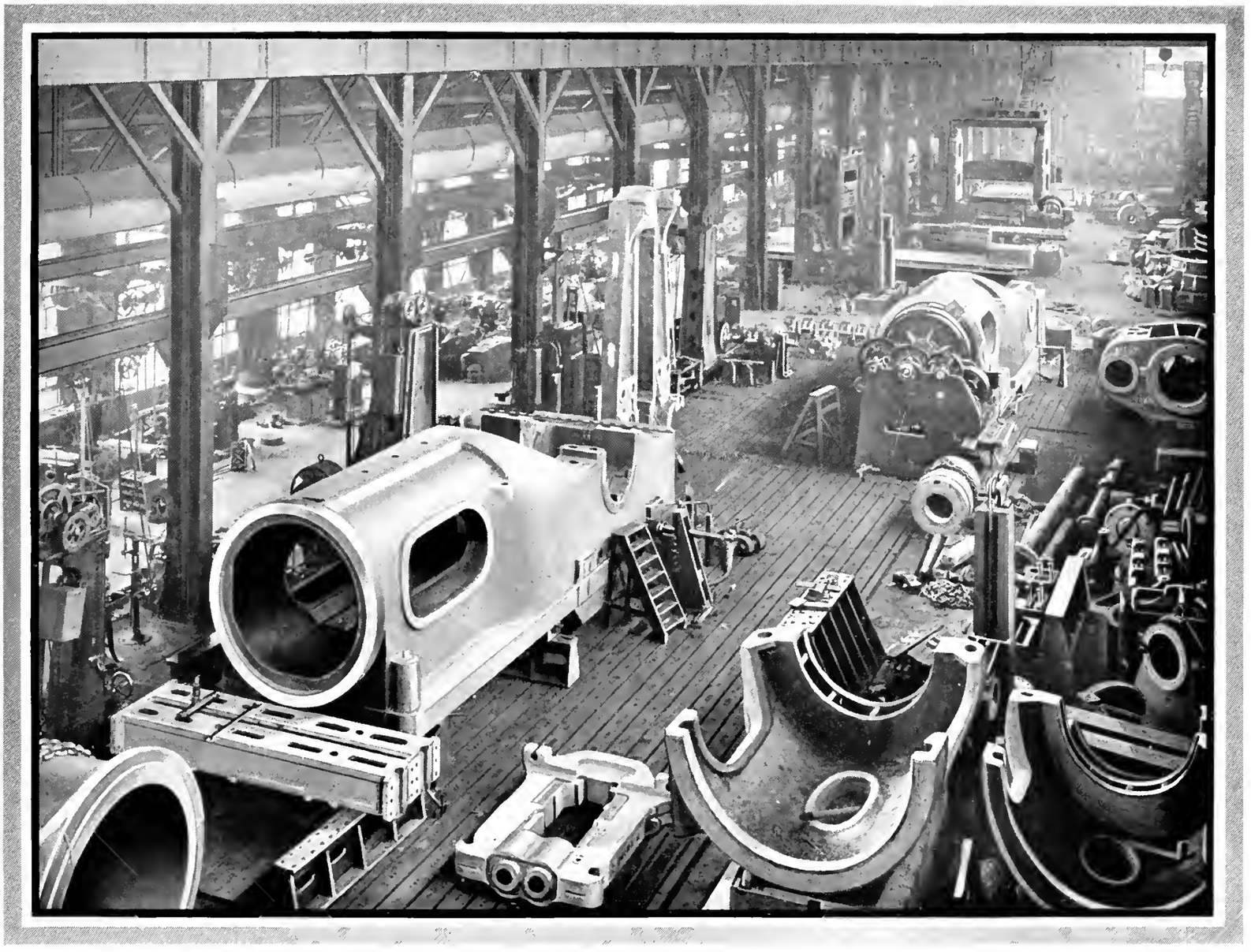
View in Machine Shop

MACHINE DEPARTMENT

THE Machine Department of the Mesta Machine Company consists of one main aisle 60 feet wide, one aisle 40 feet wide and one aisle 25 feet wide, all 1000 feet in length; also two aisles, each 60 feet wide, and one aisle 20 feet wide by 460 feet in length. These buildings are of steel and concrete construction and are equipped with cranes ranging in capacity from 5 to 100 tons.

In the main aisle are large modern machine tools for machining heavy castings and forgings, among which may be mentioned, planers up to 14 feet, boring mills up to 20 feet, lathes up to 96 inches, a pit lathe that will swing up to 36 feet, and gear cutters to cut gears up to 30 feet diameter and 6 feet face; also heavy portable tools, such as, horizontal boring mills, draw-cut shapers, drill presses and special boring machines.

The above illustration shows one end of the main aisle; the 14-foot planer



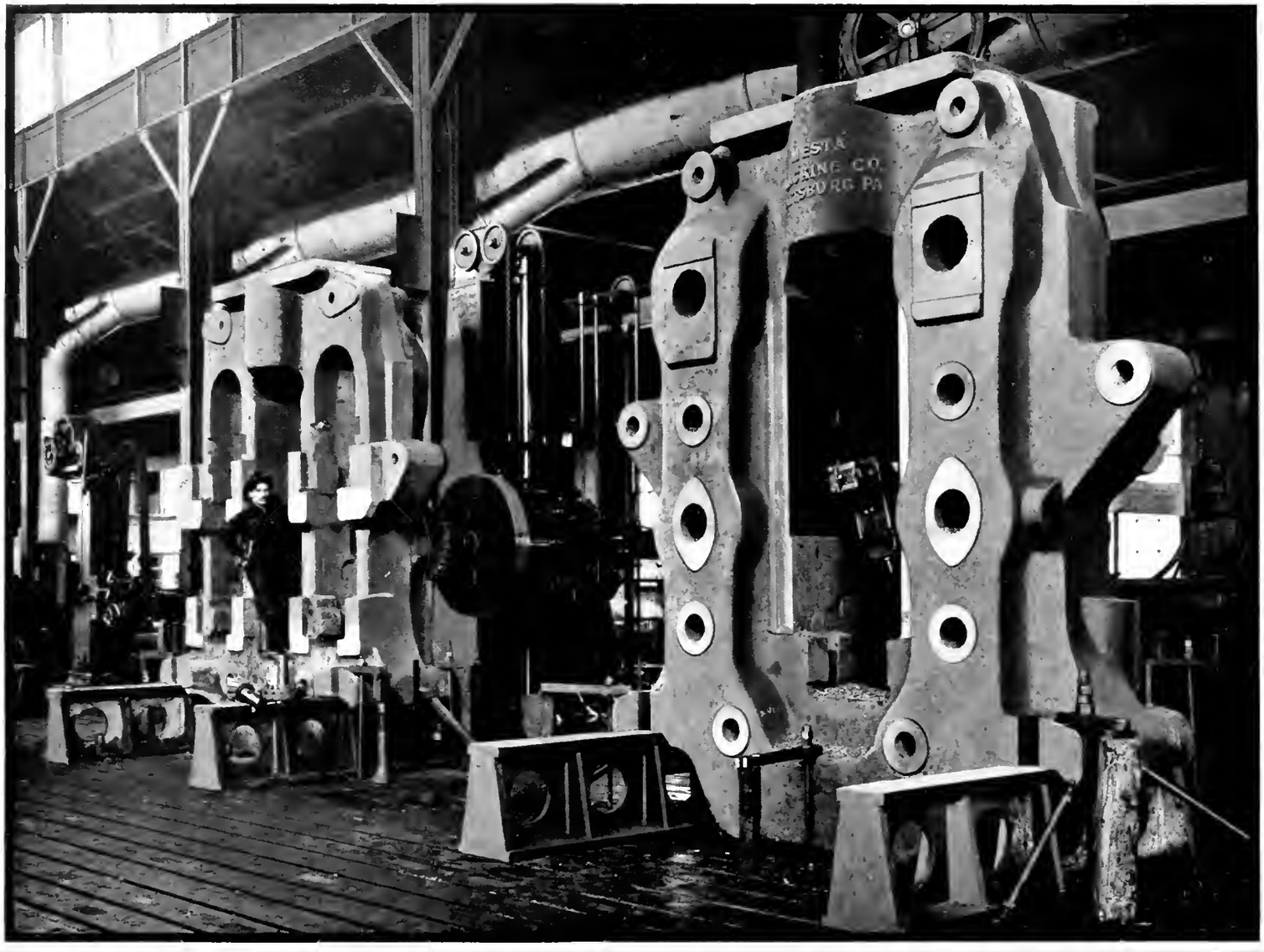
View in Machine Shop Showing Large Surface Plate

in the foreground is shown machining a number of rolling mill housings.

Particular reference is made to a large surface plate, as shown in the above illustration, which is located at one end of the main aisle in the machine shop. This surface plate is 60 feet wide by 160 feet long and is made of cast iron, accurately machined and grouted in concrete on the same level as the main aisle floor. This surface plate is very accurately leveled; the variation over its entire surface being within a few thousandths of an inch.

Large castings are set up on this surface plate so that a number of portable machine tools can be working on different operations on the same piece at the same time, thus reducing the amount of handling and greatly facilitating delivery.

In the 25-foot and 40-foot aisles 1000 feet long and in the 20-foot and 60-foot aisles 460 feet long are located

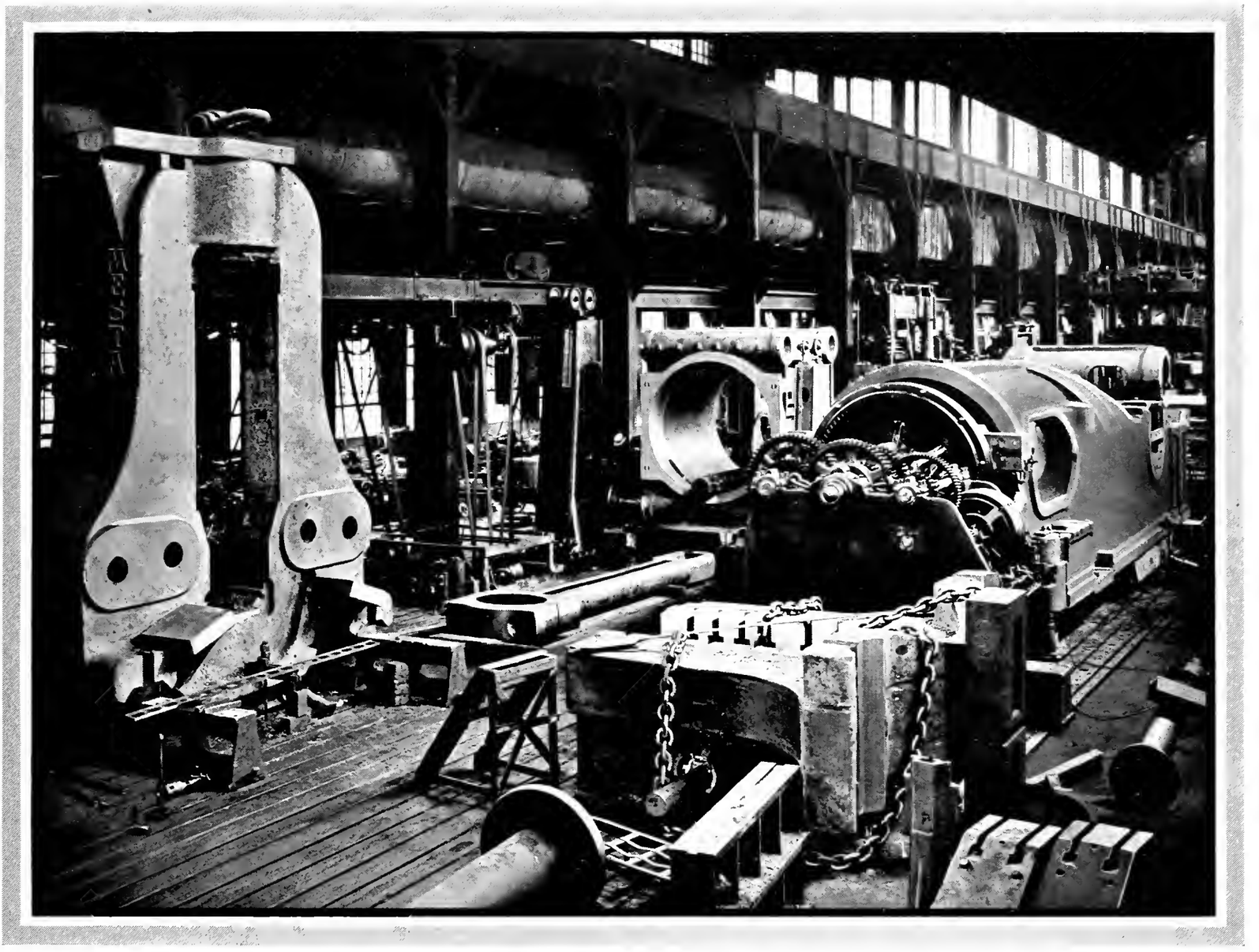


View in Machine Shop

various classes of machine tools, such as lathes, planers, boring mills, shapers, slotters, drill presses, milling machines, gear cutters, etc., for finishing medium and small size miscellaneous parts.

One department in the 40-foot aisle 200 feet long is equipped with lathes ranging in sizes from 36 inches to 50 inches and a department in the 60-foot aisle 460 feet long is equipped with a number of heavy duty lathes ranging in sizes from 52 inches to 72 inches together with a number of slotters and planers for machining forgings. This department also contains specially designed horizontal drilling machines and power reamers for the drilling and reaming of flanged shafting and a centering table of special design for centering and laying off the rough forgings. In one end is a fitting floor for propeller shafting, thrust blocks, stern tubes and other ship machinery.

The 20-foot aisle 460 feet long is



View in Machine Shop

constructed with a balcony its entire width and length. Here are finished small parts such as air valves, governors, and small parts for gas engines. It is also equipped with storerooms for the storing of such small parts, to be delivered to the erecting department when needed.

The general shop floor of this aisle is equipped for the fitting up of these small parts, so that the heavy cranes in the main erecting department are relieved of much of this light handling.

The erecting floor storerooms are also located in this aisle where the material is received from the general storeroom and held until it is needed on the erecting floor. A portion of this department is also equipped with machinery for plate and sheet iron work, such as lagging, guards and gear covers.

A department for making tools, dies, templets, gauges, etc., and for the

View in Machine Shop

general repairing of machine tools, is located at one end of the 40-foot aisle.

At the center of this aisle is the tool distributing department, the location of which is central with the whole machining department. Adjoining this department is the inspection department having charge of all measuring instruments, gauges, templets, etc., for inspecting the work after it is machined.

All machine work is done under a limit system. As soon as a part is machined it is checked for accuracy and must not vary either way more than a certain predetermined amount, or whatever limits are permissible for that piece.

The finished parts after being inspected are transferred to the erecting department. The object of the limit system and inspection is to prevent parts going to the erecting department which could not be assembled properly and the delays incident thereto.

View on Erecting Floor

ERECTING DEPARTMENT

THE main erecting department is 60 feet wide by 460 feet long, with an auxiliary department 60 feet wide by 100 feet long. The height is 36 feet to the crane-rail, but in the auxiliary department there are double-deck cranes; the upper runway being 50 feet high, so that vertical engines, presses, etc., can be completely assembled.

In this department is a specially designed hydraulic pusher of 10,000 tons capacity, for assembling built-up crank shafts, etc.; also testing pits for making hydrostatic tests.

Finished parts are delivered to the erecting floor by motor-driven transfer cars of 100 tons capacity.

Many quick delivery records have been made by this Company. A large blowing engine weighing 900,000 pounds delivered in 45 days; a mill engine weighing 500,000 pounds in 30 days, and a large reversing engine crank shaft in 10 days, are notable cases.

View in Roll Turning Department

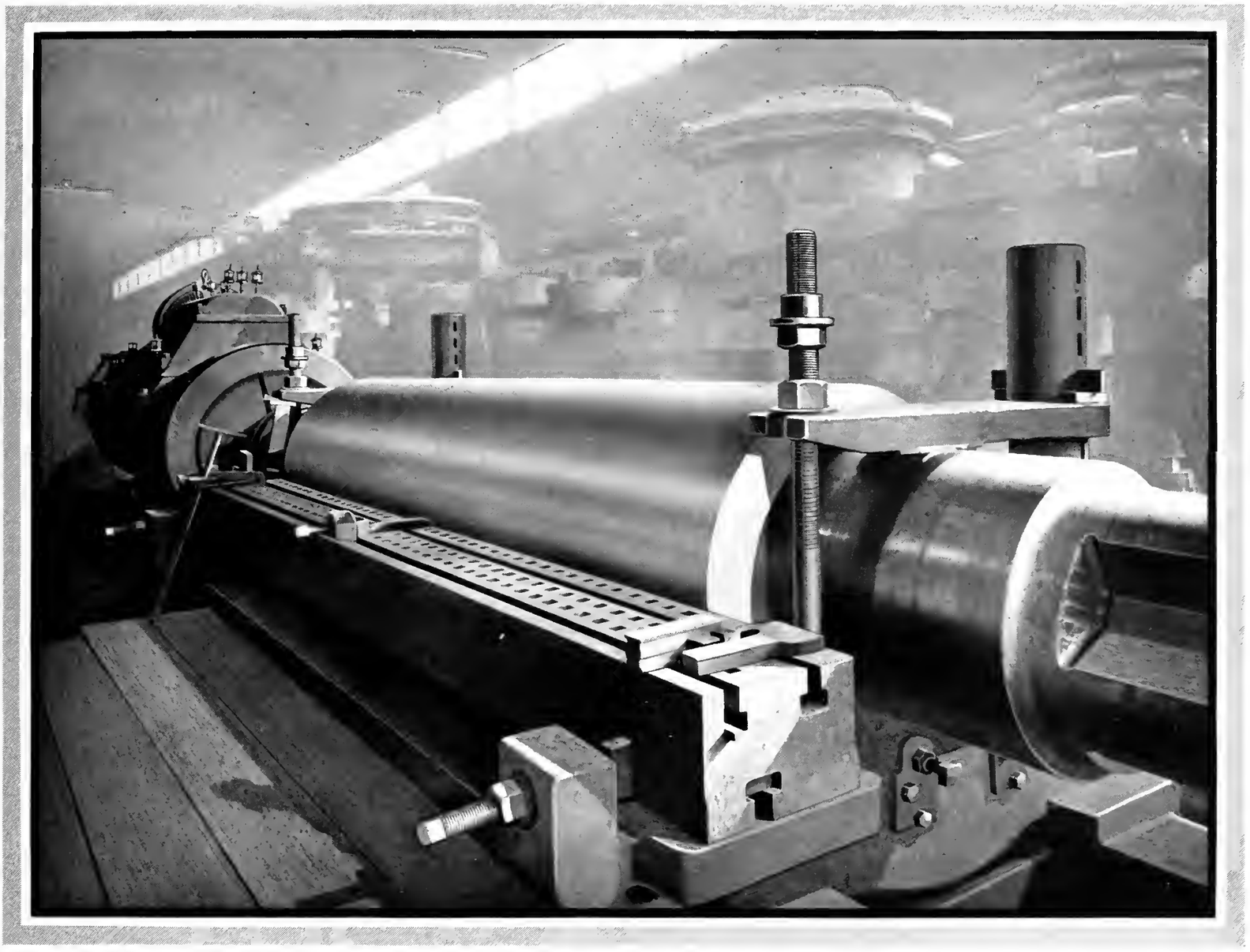
ROLL TURNING DEPARTMENT

A LARGE percentage of the rolls manufactured by this Company are finished complete ready for installation in the mill.

In addition to those which are finished complete, a large number have the necks finished while the bodies are left rough or rough machined only, to be finally finished at the mill. Other rolls are furnished entirely in the rough.

To insure prompt deliveries and to furnish the highest quality of workmanship, the Mesta Machine Company has provided two large roll turning departments, one known as the Roughing Department and the other as the Finishing Department.

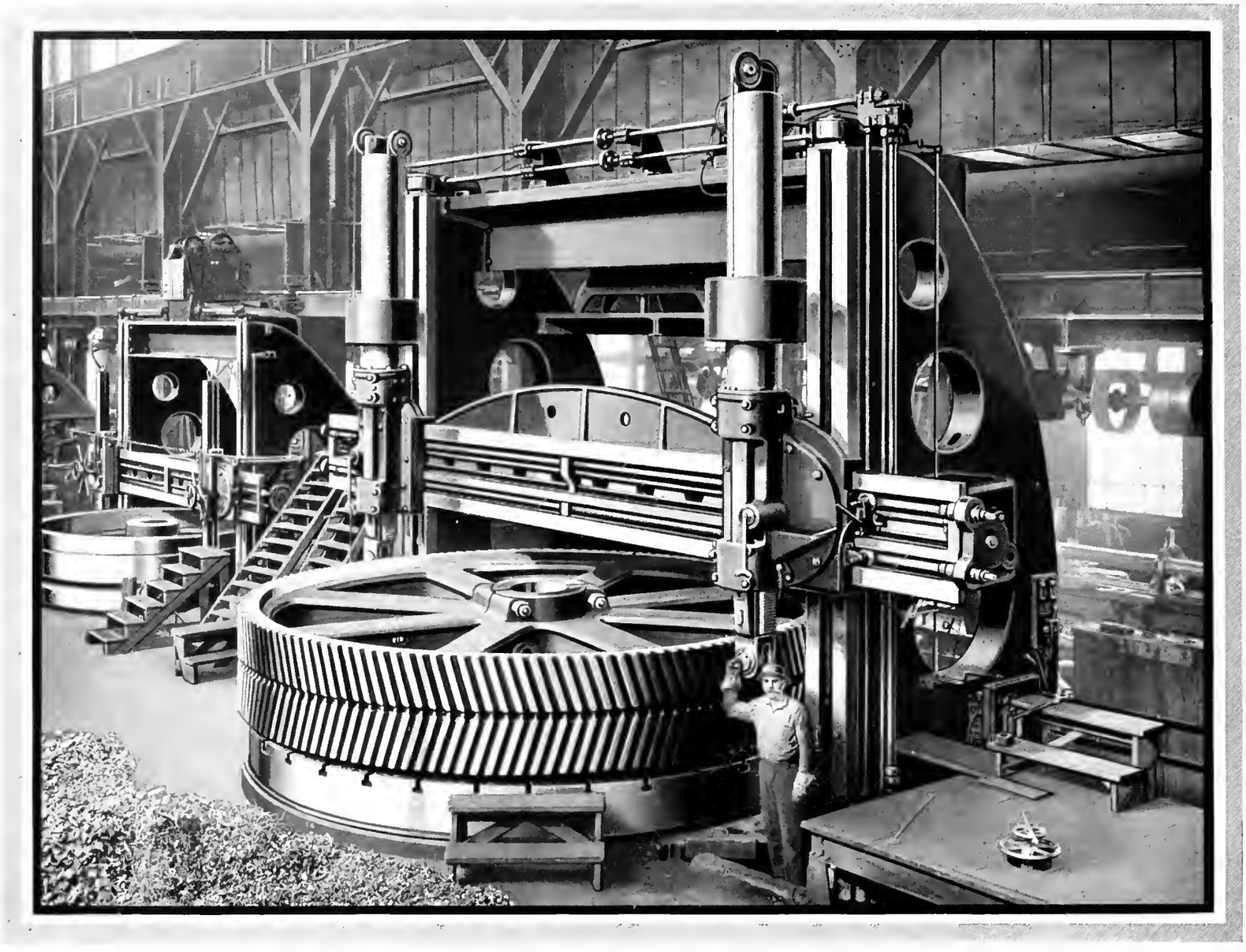
The Roughing Department is located in a building 40 feet wide by 140 feet long adjacent to the Roll Foundry Department, and is equipped with ten Mesta Roll Turning Lathes of various sizes. The rolls are first brought to this department to have the sinkheads



Finishing a 44″x160″ Chilled Plate Mill Roll

removed and test cuts taken so that the rolls can be thoroughly inspected. Rolls to be delivered in the rough are shipped direct from this department.

Rolls to be finished after having the sinkheads removed are transferred to the Finishing Department, which is located at one end of the main machine shop building, adjacent to the foundry building. This department consists of two aisles, one 60 feet wide and the other 27 feet wide, both 240 feet long. The equipment in this department consists of 19 Mesta Roll Turning Lathes ranging in sizes from 18 inches to 60 inches for turning any size of rolls from the smallest to the largest required in the rolling mill industry. In this department are also heavy slotters, horizontal boring mills and drill presses for machining wabblers of rolls, and a grinding machine for grinding the necks and bodies of rolls that require an exceptionally high degree of finish.



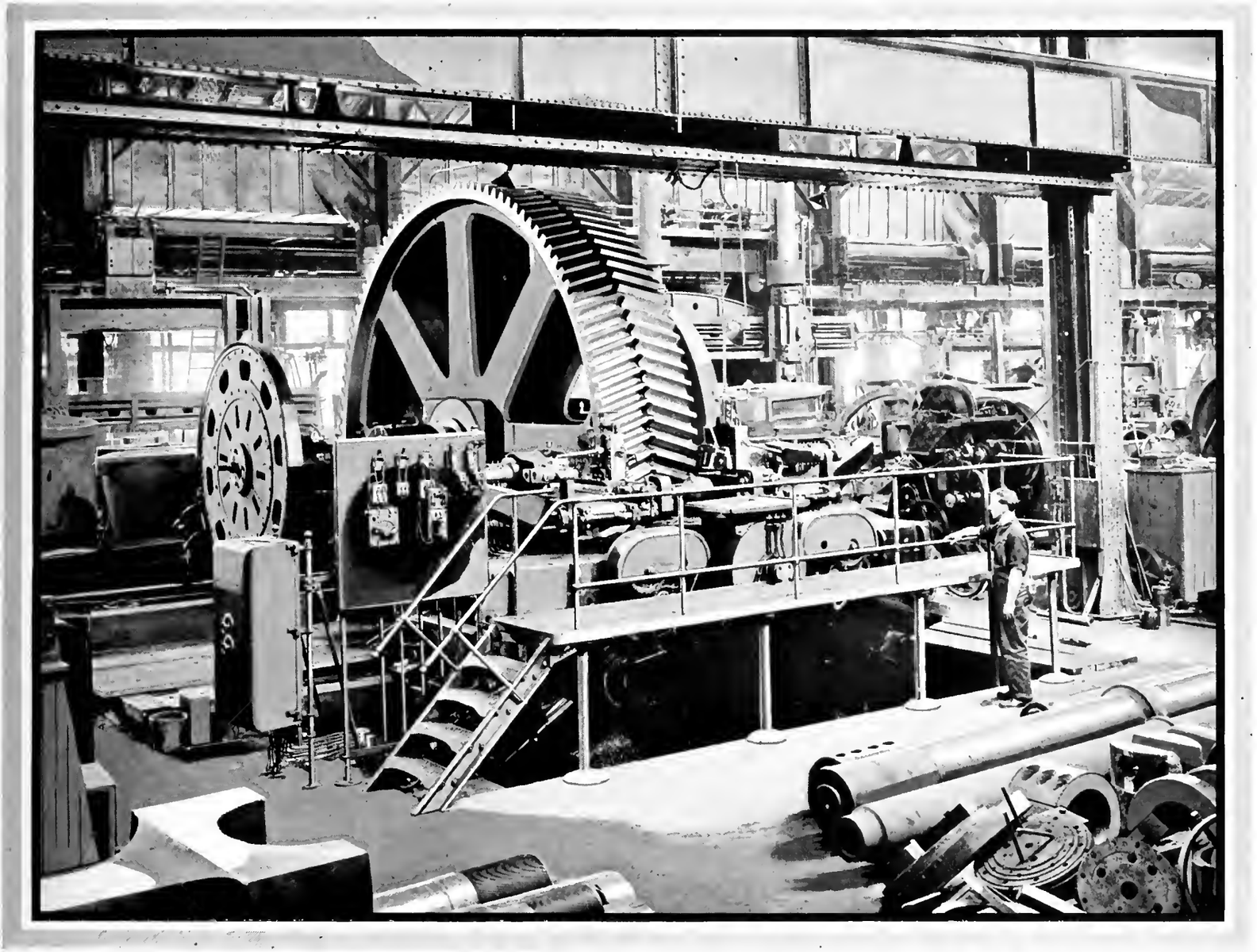
Turning Large Double Helical Gear on Boring Mill

GEAR CUTTING DEPARTMENT

THE Gear Cutting Department is equipped with straight-spur, bevel and double helical gear cutting machines for machining the teeth in gears of all sizes up to 30 feet in diameter by 6 feet face and of any pitch of tooth required.

The larger machines are located in the main 60-foot aisle while the smaller machines are located in the adjacent 40-foot aisle. A number of vertical boring mills for boring and turning the gears are located in the 60-foot and also in the 40-foot aisles, directly opposite the gear cutting machines. Gears too large to be turned and bored on the 20-foot vertical boring mill shown in the above illustration are machined on a pit lathe which will handle gears up to the largest diameters required.

All of the large gear cutting machines in this department were built by the Mesta Machine Company and are of the screw-operated type, driven by



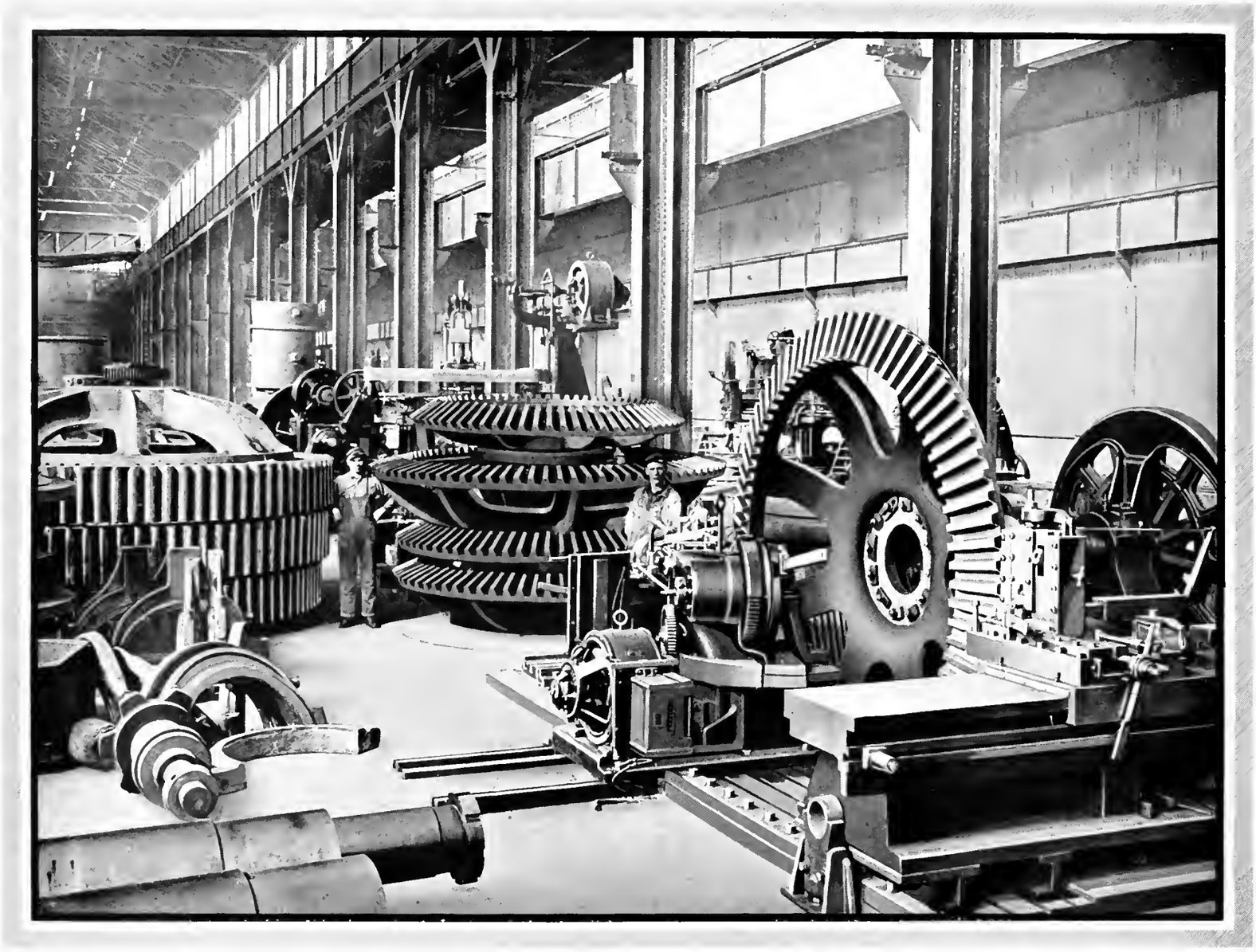
Planing Teeth in Double Helical Gear on Mesta Patented Double Helical Gear Planer

reversing motors.

To meet the increasing demand for correctly cut double helical gears this Company designed and built special gear planers which are fully covered by patents and employ a method that is entirely different from that used in any other type of helical gear cutting machine.

The method employed is that of holding the gear stationary while the teeth are being machined; all motion being confined to the cutting tool. Since the gear is held stationary and does not oscillate as in the case of other types of helical gear cutters, no lost motion whatever occurs during the cutting operation.

Gears cut on these gear planers are, therefore, more accurate than those cut by any other method, which is evidenced by the fact that Mesta gears do not require any grinding-in before being put in operation.



View in Gear Cutting Department

The above illustration shows one of the large bevel gear planers in the Mesta gear cutting department cutting a gear of heavy pitch for a continuous mill drive.

All of the castings for the cut gears manufactured by this Company are made in the Mesta foundries and can be furnished of air furnace melted cast iron, acid open hearth cast steel or alloy steel.

It is not only essential that the gears have accurately cut teeth, but in addition, the design of the teeth must be correct; furthermore, there must be a uniform distribution of metal throughout in order to insure the casting being free from any initial strain. Mesta gears are properly designed both with respect to profile of tooth and distribution of metal, accurately cut, and the practice used in molding, casting and annealing insures sound castings that will give long and satisfactory service.

LIST OF PRINCIPAL PRODUCTS

GAS AND STEAM ENGINES

for

Blast Furnaces, Rolling Mills and Power Plants
Gear Drives and Rope Drives
Condensers and Vacuum Pumps
Air Compressors

ROLLING MILL MACHINERY

Blooming Mills	Universal Mills	Squaring Shears
Slabbing Mills	Sheet Mills	Plate Shears
Structural Mills	Tin Plate Mills	Bloom Shears
Rail Mills	Wheel Mills	Bar Shears
Bar Mills	Tire Mills	Hot Saws
Continuous Mills	Mill Tables	Transfers
Tube Mills	Manipulators	Accumulators
Plate Mills	Doubling Shears	Roll Lathes

Chilled Iron, Sand Cast Iron, Steel, Alloy Steel and Special Rolls
Cut and Machine Molded Rolling Mill Pinions

SPECIAL MACHINERY

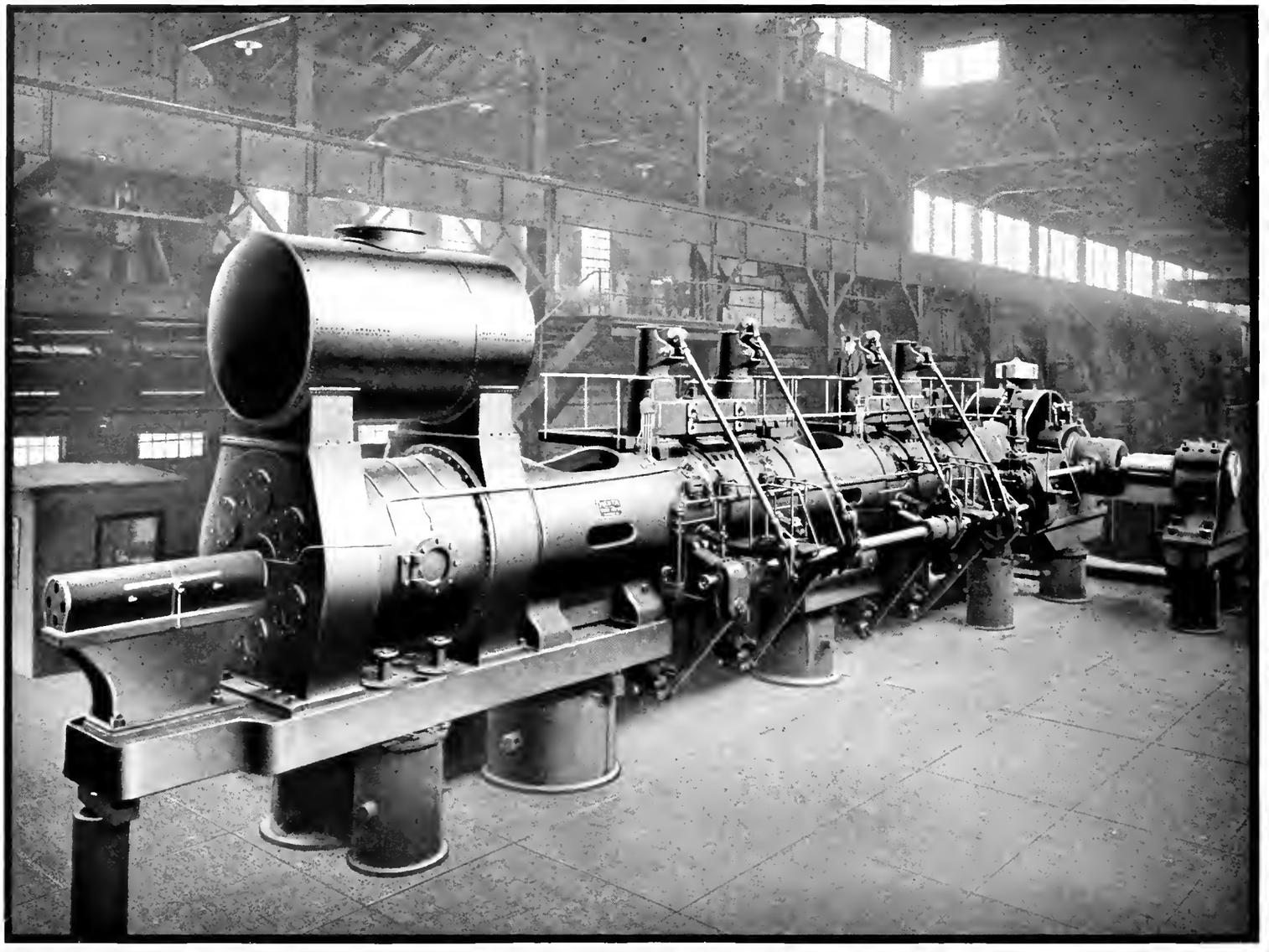
Steam Hydraulic Forging and Bending Presses
Steam Hydraulic Shears
Pickling Machines Metal Mixers
Iron and Steel Cut Gears
Iron and Steel Machine Molded Gears

FORGINGS

Large Engine Shafts, Piston Rods, Connecting Rods
Ship Shafts and General Forgings

CASTINGS

Carbon Steel Castings Alloy Steel Castings
Air Furnace Iron Castings Bronze Castings
Carbon Steel and Alloy Steel Forging Ingots



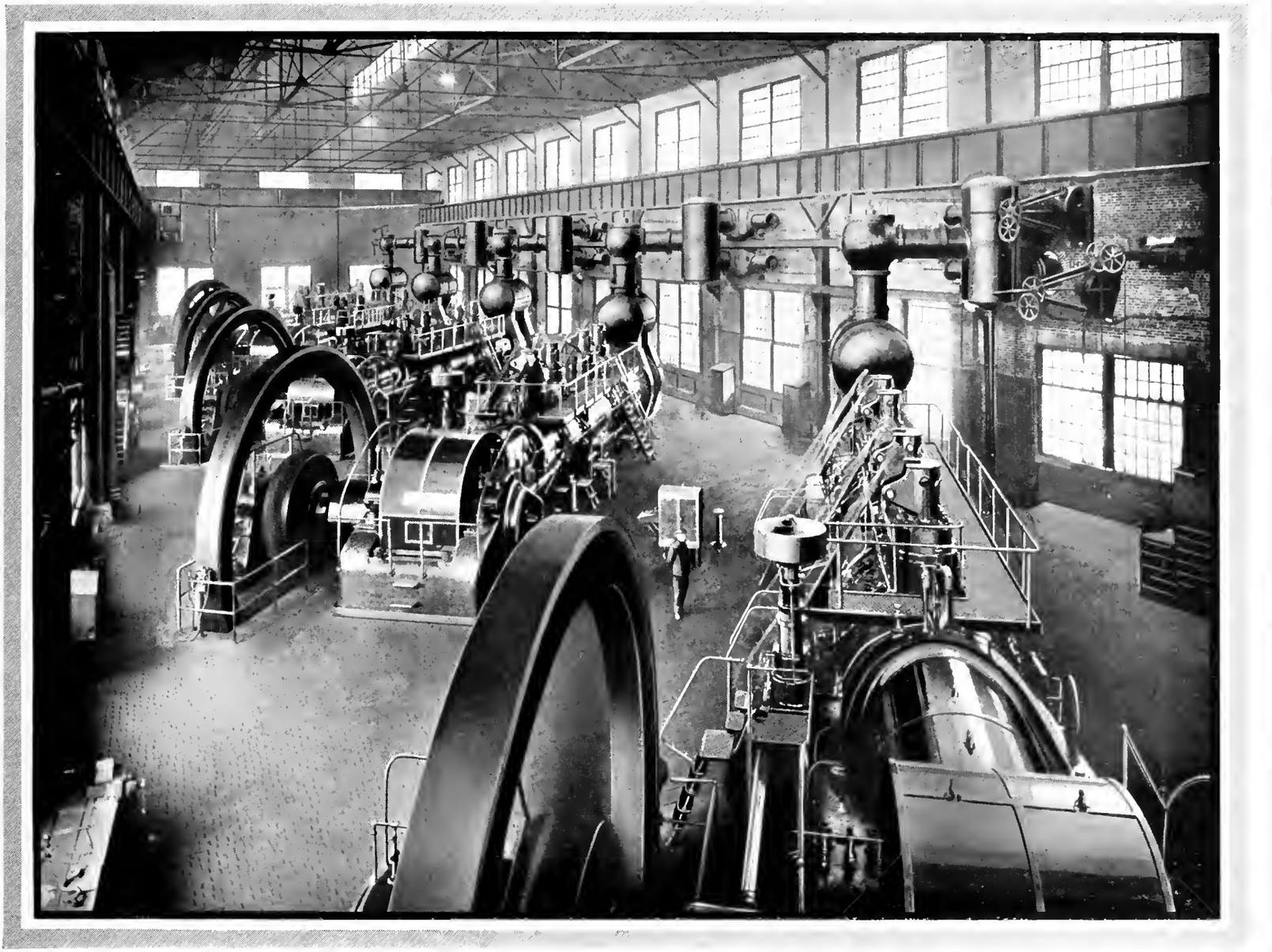
46″ and 84″x60″ Horizontal Mesta Single Tandem Gas Blowing Engine on Erecting Floor

GAS BLOWING ENGINES

IN order to operate a Blast Furnace and Steel Plant at its maximum efficiency or at a minimum cost of production, careful attention must necessarily be given the question of utilizing the surplus gas from the blast furnaces to operate the blowing engines and also the power engines for generating the electric power necessary, so that no additional fuel need be provided in order to operate the plant.

In order to approach such a point of efficiency, it is important that prime movers be selected of a type which operate safely, have a low fuel consumption and low maintenance cost.

The modern Gas Engine has all of the advantages in this respect. Its high thermal efficiency is without dispute and its reliability in operation is no longer a question of doubt. Actual operating experience has shown that the cost of maintenance of a properly designed gas engine plant is lower than



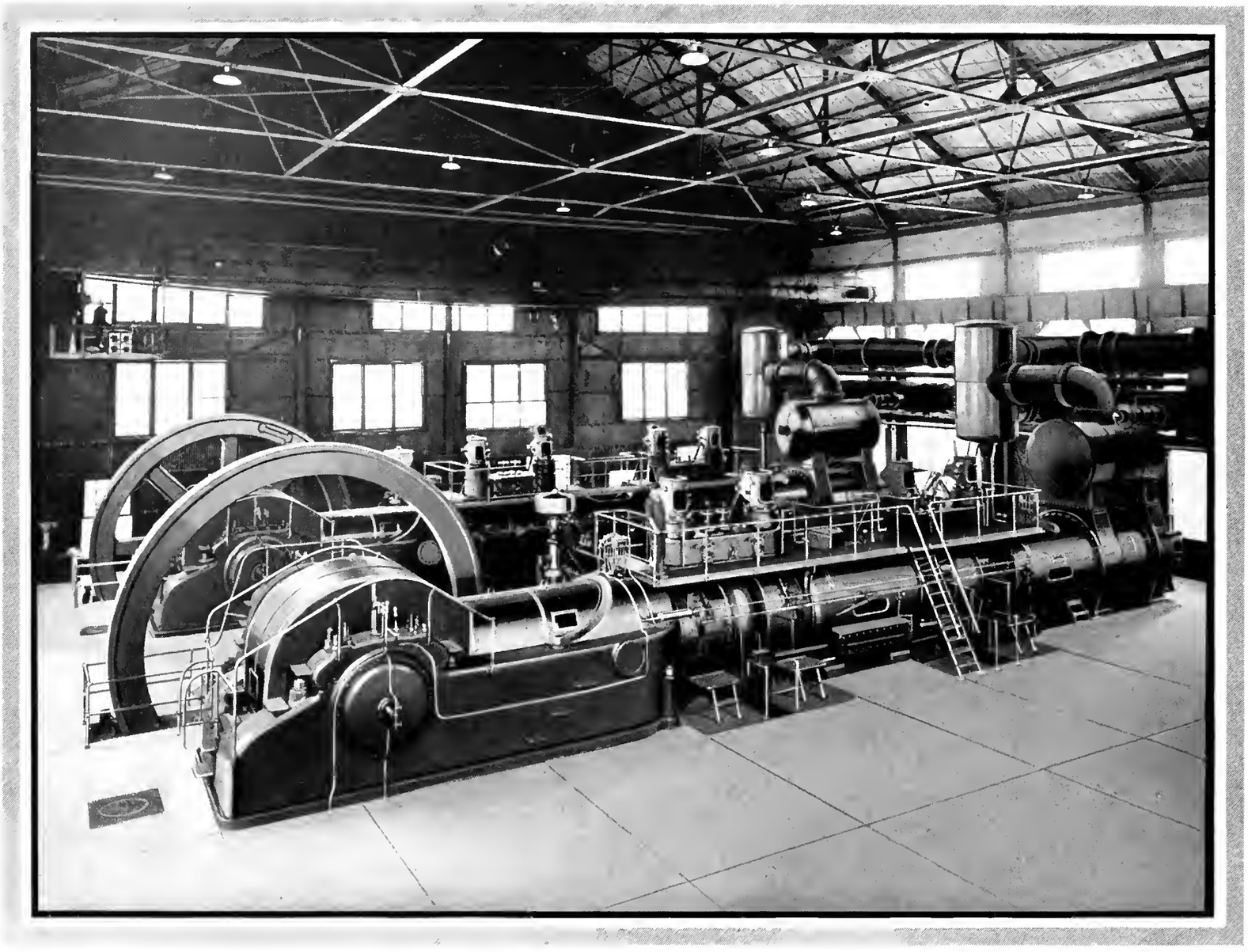
Installation of Five 46″ and 84″x60″ Mesta Single Tandem Gas Blowing Engines at the Lackawanna Steel Company

that of a steam plant with its boilers and other accessories.

The Mesta Gas Blowing Engine is the result of many years of careful study and investigation of this type of prime mover. In the development of this engine the principal objects in view have been correctness and simplicity in design, ruggedness in construction and reliability in operation. Actual operating experience with Mesta Gas Blowing Engines has fully proven that these important features have been most successfully attained in every way.

A Gas Blowing Engine plant can now be installed and put in operation more readily than a steam plant and it has been pointed out by plant operators that for reliability, economy and ease of operation, the Mesta Gas Blowing Engine is to be preferred to any steam-driven unit.

The above illustration shows an



Two of Three 46″ and 84″x60″ Mesta Single Tandem Gas Blowing Engines Installed at the Pennsylvania Works of The Bethlehem Steel Company

installation of five Mesta Gas Blowing Engines operating in connection with two 500-ton Blast Furnaces.

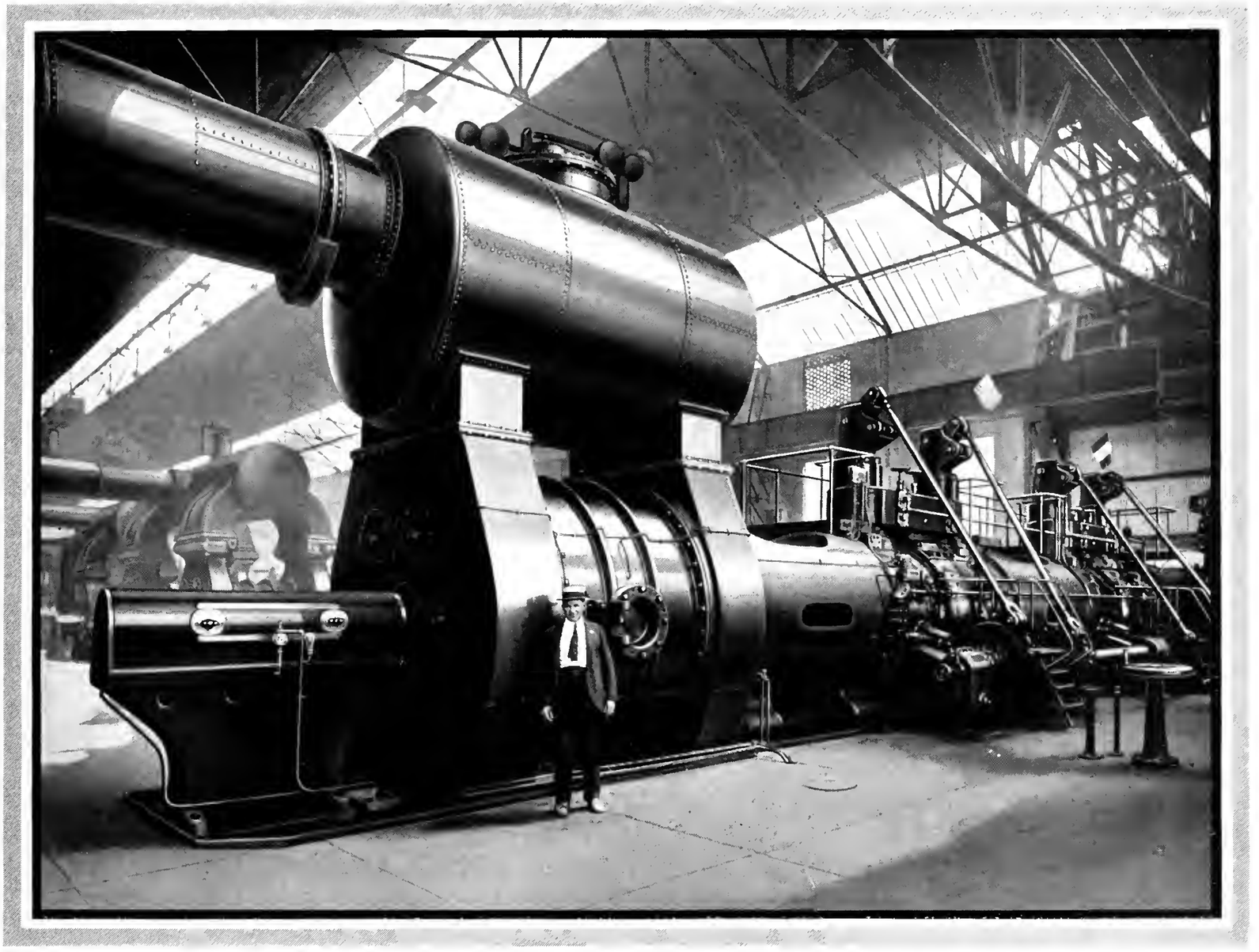
These engines are of the single tandem type and operate normally at a speed of 60 revolutions per minute.

Two engines supply the blast for each furnace; the fifth engine being held in reserve.

It will be noted that the engines are arranged diagonally in the building, which is a new feature in power house arrangement, and reduces considerably the initial cost of installation.

Another feature of this installation is the single tandem type of engine instead of the usual twin tandem type. With the single tandem type of engine, greater flexibility in operation is obtained while the initial cost is lower.

The Mesta Machine Company has the distinction of being the first gas blowing engine manufacturer in the United States to arrange the air cyl-

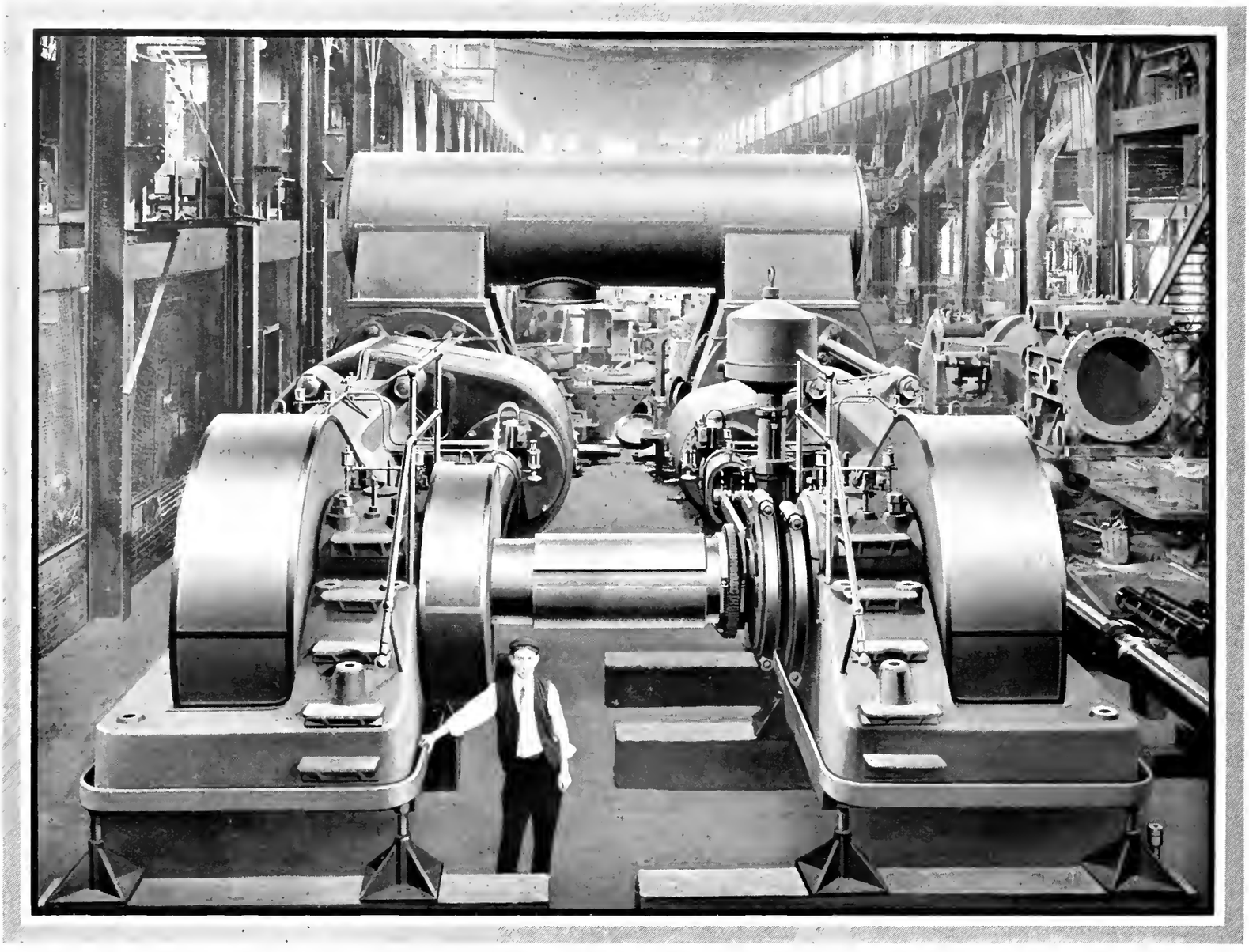


46″ and 96″x60″ Mesta Gas Blowing Engine Installation at The Bagnoli Works of Societa Ilva, Italy

inders in tandem with, or, in other words, directly back of the gas cylinders. This arrangement was made possible by using automatic plate valves instead of mechanically operated valves in the air cylinders. A description with illustrations of the well-known Mesta Plate Valve will be found on pages fifty and fifty-one.

Among other important features may be mentioned the center throw crank shaft with double bearing bed plate. This construction has the advantages of centralizing the working stresses and considerably increasing the mechanical efficiency of the engine.

Actual tests of the Mesta Gas Blowing Engine have shown a mechanical efficiency of 85.5 per cent, a heat consumption of less than 9000 B. T. U. per brake horse power per hour, corresponding to a thermal efficiency of about 29 per cent, and a volumetric efficiency of 96 per cent.



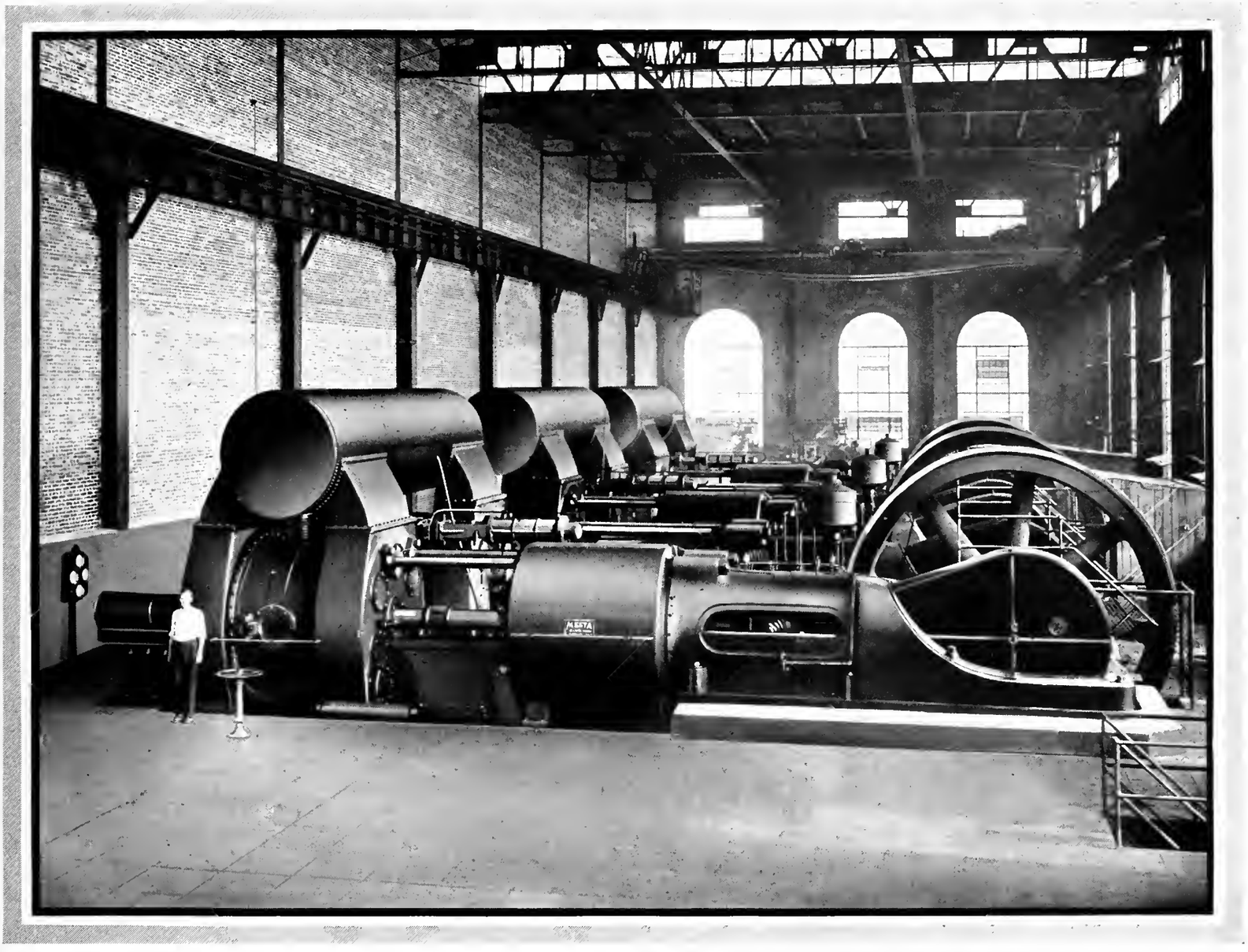
Steam Blowing Engine on Erecting Floor

STEAM BLOWING ENGINES

FOR smaller and isolated blast furnace plants or where no steel works are operated in connection with the blast furnace plant, the reciprocating steam blowing engine is the most practical solution for blowing furnaces.

The advent of the gas engine for driving blast furnace blowers created the necessity of developing a blowing end that would operate at considerably higher speeds than that commonly used with the old style steam blowing engine. The Mesta Automatic Plate Valve (Iversen Patent) successfully solved the difficulties encountered and enabled the Mesta Machine Company to develop their modern high speed steam blowing engine. The simplicity of the valve gear and the small number of moving parts in the engine reduces the cost of maintenance to a minimum; practically no adjustments being necessary at any time.

Improvements made by the Mesta



Installation of Three 34″ and 66″ and 84″ and 84″x48″ Mesta Steam Blowing Engines at the Plant of the McKinney Steel Company

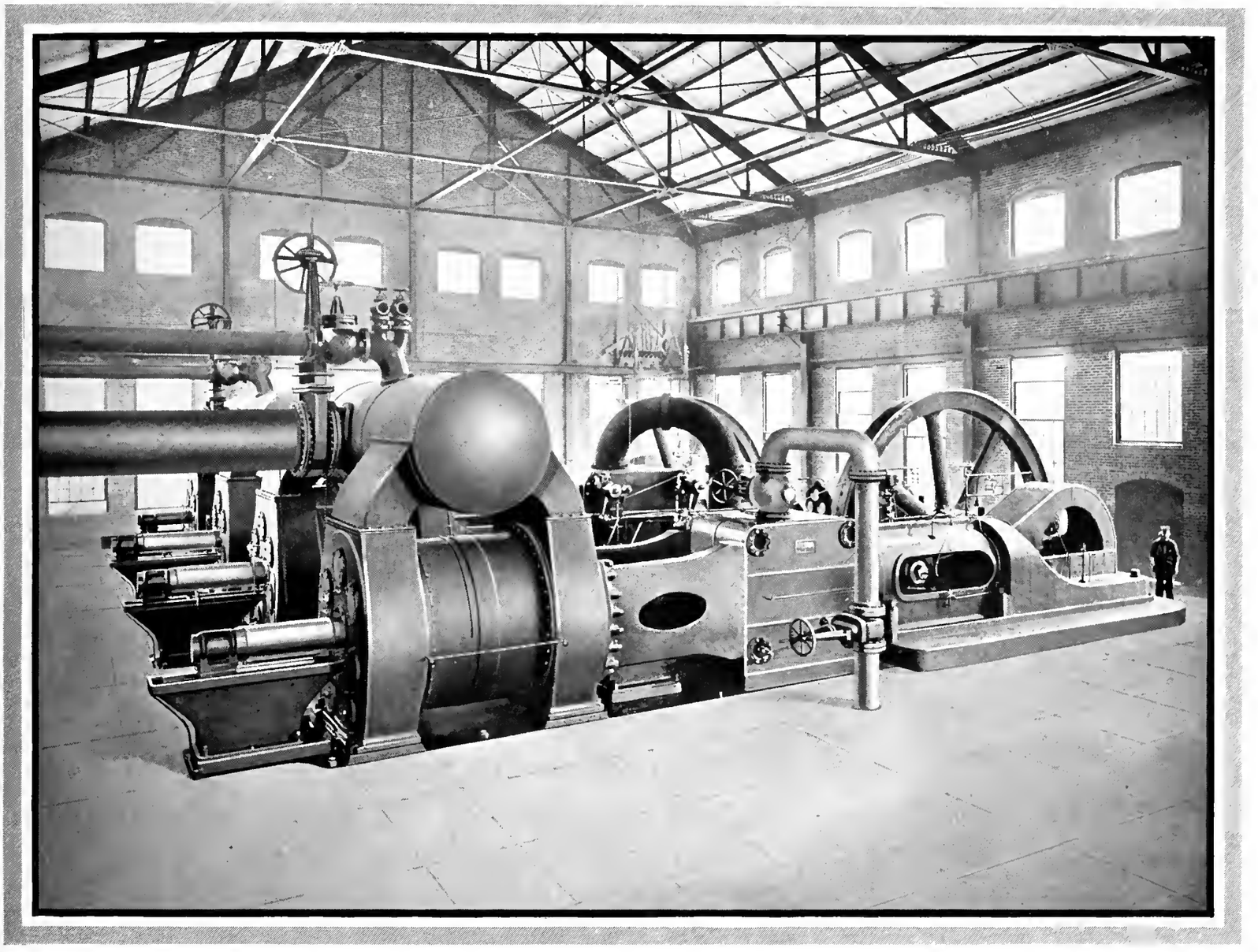
Machine Company on the piston valve type of steam valve gear have also made this type of engine suitable for high steam pressures and superheats. The three-piston valve type of high speed blowing engines illustrated above are operated with a steam pressure of 225 pounds per square inch above atmosphere and 100 degrees superheat, each blowing a 600-ton furnace, and have now been in successful operation for five years. During this time these engines have incurred practically no maintenance expense and are, as far as this Company knows, the most economical steam blowing engines operating anywhere. Actual tests, after the engines had been operating for four years continually and without making preliminary adjustments or overhauling, showed that the engines were developing a brake horse power on 12600 B. T. U.'s per hour, and combined with the high efficiency of the Mesta Blowing End

Mesta Horizontal Cross Compound Steam Blowing Engines on Erecting Floor

required only 1.1 pounds of steam per 100 cubic feet of air delivered at 15 pounds pressure.

The Mesta High Speed Steam Blowing Engine is of heavy construction throughout, with heavy Tangye type bed plates, heavy sole plates under steam and air cylinders, liberal size pins and bearings throughout; heavy oil guards cover all moving parts and the lubricating system is entirely automatic. A variable speed governor actuates the cut-off valves of the high pressure cylinder. A hand wheel on the governor column is provided for adjusting the speed to whatever is required by the furnace. A large air receiver connects the two air cylinders, which reduces pulsations and eliminates shaking of the blast line. An air intake duct is formed in the foundation and connects with suction pipe for drawing the air from the outside of the building.

Steam-driven blowing engines, hav-



18″ and 84″ and 84″ and 84″x60″ Mesta Horizontal Cross Compound Steam Blowing Engines
Installed at the Plant of the Youngstown Sheet and Tube Company

ing Corliss steam valve gear, have also been built by the Mesta Machine Company in large numbers.

The Corliss steam valve gear has been a favored type in the United States for many years and is still preferred by a great many concerns. For steam pressures not in excess of 160 pounds per square inch and superheats not over 50 degrees Fahrenheit, this type of engine is very successful and economical.

The Long Crosshead type of Steam Blowing Engine with Corliss Steam Valve Gear is another type of engine which has been developed by the Mesta Machine Company to the highest degree of efficiency and reliability. The advantage of this engine is that it requires very small floor space and makes a most economical installation where space is limited. The economy of operation is about equal to that of the Horizontal Cross-Compound type,

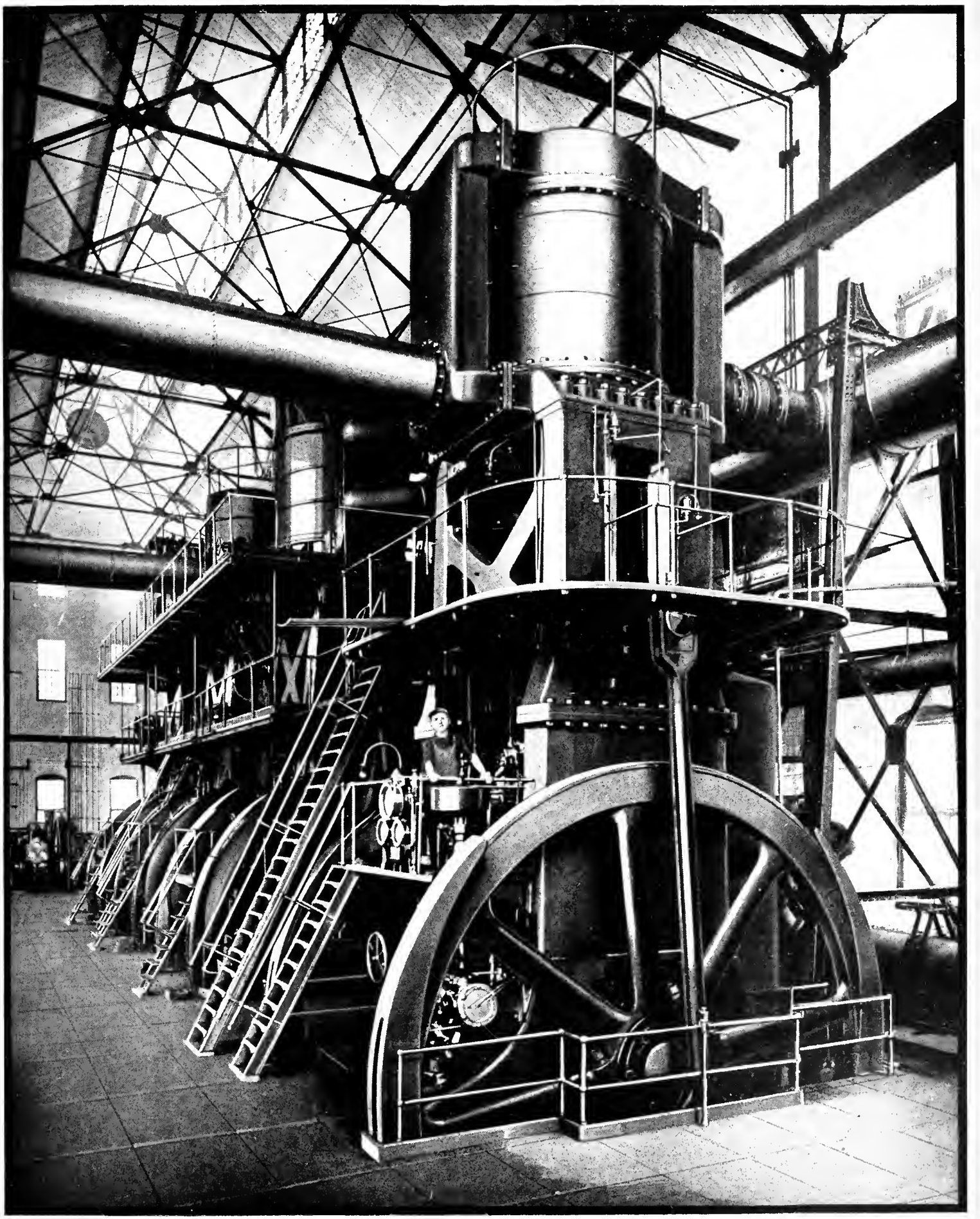
Vertical Long Crosshead Type Blowing Engine on Erecting Floor

having Corliss Valve Gears. More Long Crosshead Blowing Engines have been built and are in operation in the United States than all other types of engines combined.

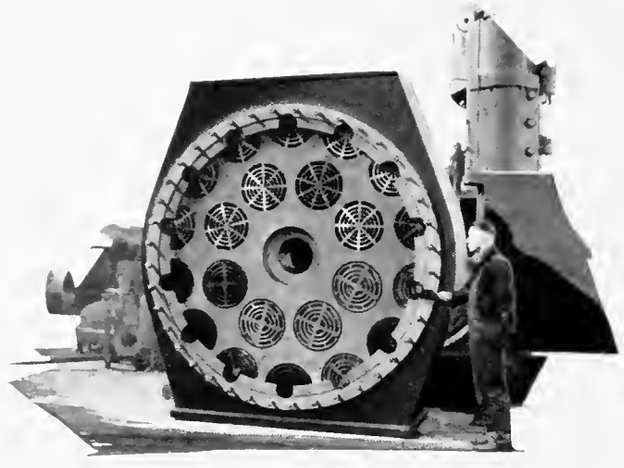
On account of its advantage in requiring a comparatively small space, this type of engine will always remain in favor, especially for plants where floor space is the limiting feature.

All Mesta Blowing Engines, whether Horizontal or Vertical, are equipped with Mesta Automatic Plate Valves for the air end.

The merits of the Mesta Steam Blowing Engine can be judged best by the fact that during the last six years, or the period from 1913 to 1919, the Mesta Machine Company built more than ninety per cent of the steam blowing engines manufactured in the United States, both for use in the United States and for export to other countries.



Engine Room of the Shenango Furnace Company Showing a Modern 44″ and 84″x60″ Mesta Long Cross-Head Blowing Engine in Foreground. The Other Engines are of Older Design But Have Been Equipped with Mesta Automatic Plate Valves—Iversen Patent



Air Head Equipped with Mesta Automatic Plate Valves (Iversen Patent)

MESTA AUTOMATIC PLATE VALVES

AMONG the various Mesta products probably none has played a more important part in the blast furnace industry than the Mesta Automatic Plate Valve. The success of this valve is due to its simplicity and durability, the selection of the special materials entering into the construction of its component parts and the extreme care exercised in manufacturing and assembling.

The highest possible efficiency is obtained by this valve. The standardization of parts has made it the standard of all blowing engine automatic plate valves and has led to its universal adoption for blast furnace blowing engines as well as for compressors and vacuum pumps.

An idea of the universal adoption of this valve can be obtained from the fact that the Mesta Machine Company has equipped more than 1100 air ends of Blowing Engines. This included new blowing engines manufactured by this Company and the remodeling of existing blowing engines of various types and makes. In addition, this Company has equipped innumerable compressors for air and gas, as well as ice machines and vacuum pumps, with these valves.

The valve consists of only four parts, the valve seat, made of hard, close-grained cast iron; the valve plate, made of the finest grade of special alloy steel; the valve spring and the guard plate or valve stop. In addition to these parts there is one central bolt used for all valves excepting the large 16-inch valve, which has four additional bolts for holding the guard plate. The fastening of the valve plate to the spring is accomplished by means of clamp hooks that are integral with the valve plate.

The spring and plate are so interlocked by these clamp hooks as to make disengagement impossible.

The valve plate is carried and guided by the valve spring. There are no sliding or frictional surfaces requiring lubrication, which accounts for its remarkable durability. The plate and a portion of the spring are the only moving parts and the multiported construction requires a very low lift for a maximum opening. The light weight

Details of a 16″ Mesta Automatic Plate Valve (Iversen Patent)

Assembled Plate Valves Illustrating Range in Sizes

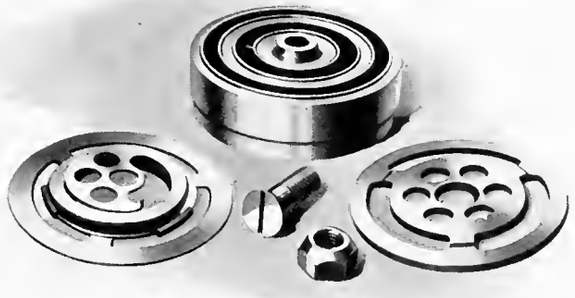
of the valve plate and the adaptation of the strength of the spring to the working conditions, enables the valve to open and close at the proper time, and with but a very small difference in pressure. Consequently, there is no accumulation of pressure before the valve opens or closes, no air friction with attendant heating and no valve gear to operate.

These valves have larger free valve area for a given diameter of opening than any other type of valve made. The maximum percentage of valve area, in relation to cylinder area, is obtained so that blowing engines and compressors equipped with Mesta Automatic Plate Valves can be operated at higher speeds and will give greater volumetric efficiency than any other type of similar equipment. In many cases the equipping of existing engines with Mesta Automatic Plate Valves has made it possible to operate additional furnaces without increasing the number of blowing engines, and at other plants this remodeling has made spare units available where formerly all units were in continuous operation.

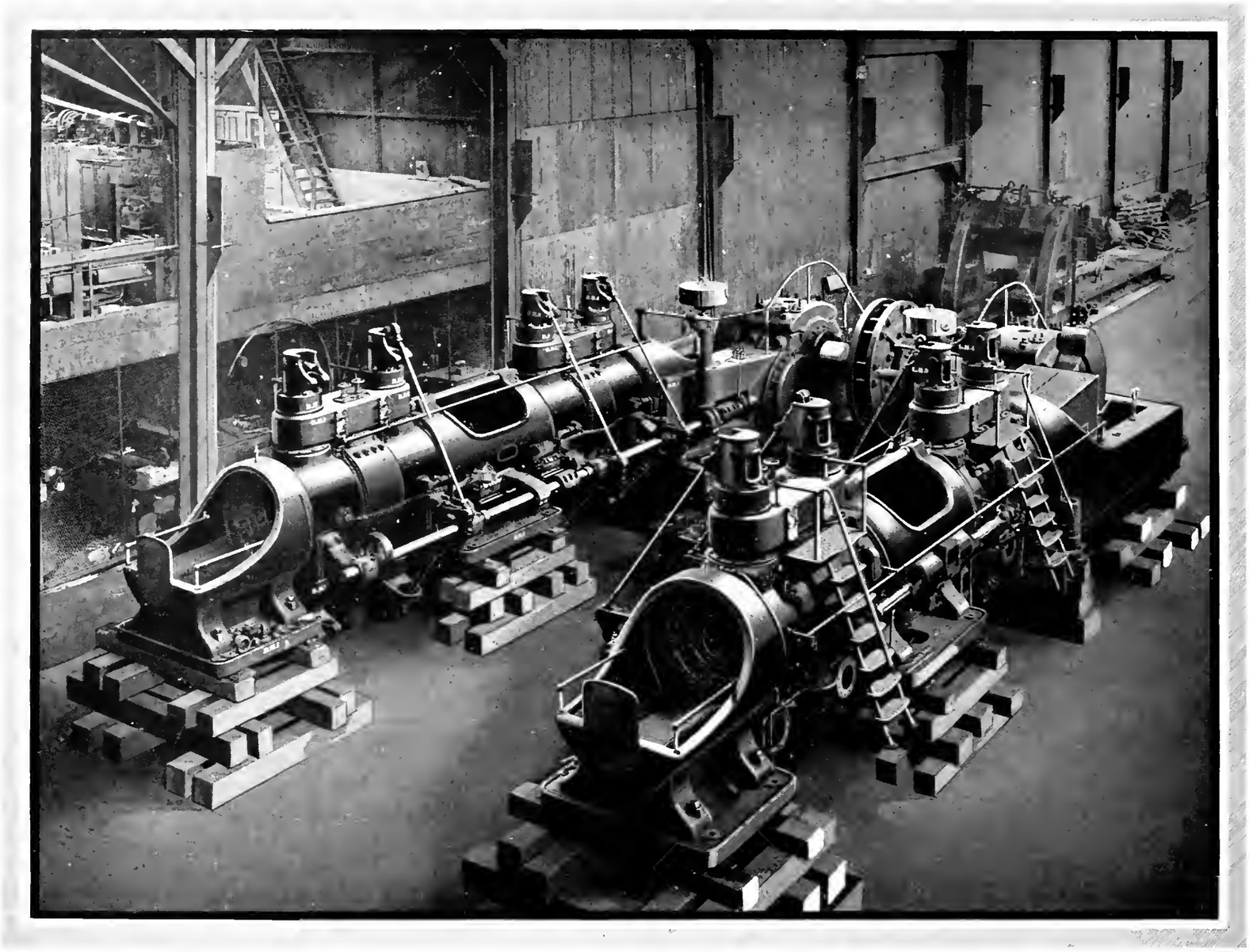
Blowing engines equipped with these valves operate not only with higher volumetric efficiency but also with higher mechanical efficiency, due to the fact that there is no mechanical valve gearing to operate and the power consumed to operate these valves is practically nothing.

The upper illustration on the opposite page is a view of the inside face of a blowing engine head with the valves in place and shows the extreme simplicity in mounting these valves in the air heads. The valves are flush with the face of the head, which reduces the clearance to a minimum. They are alike for inlet and outlet, being merely placed in the head in the reverse position.

The upper illustration on this page shows a comparison of Mesta Automatic Plate Valves which are made in standard sizes, ranging from 2 inches to 16 inches in diameter. The lower illustration shows a disassembled 6-inch valve.



Details of a 6″ Mesta Automatic Plate Valve
(Iversen Patent)



2000 H.P. Gas Power Engine on Erecting Floor

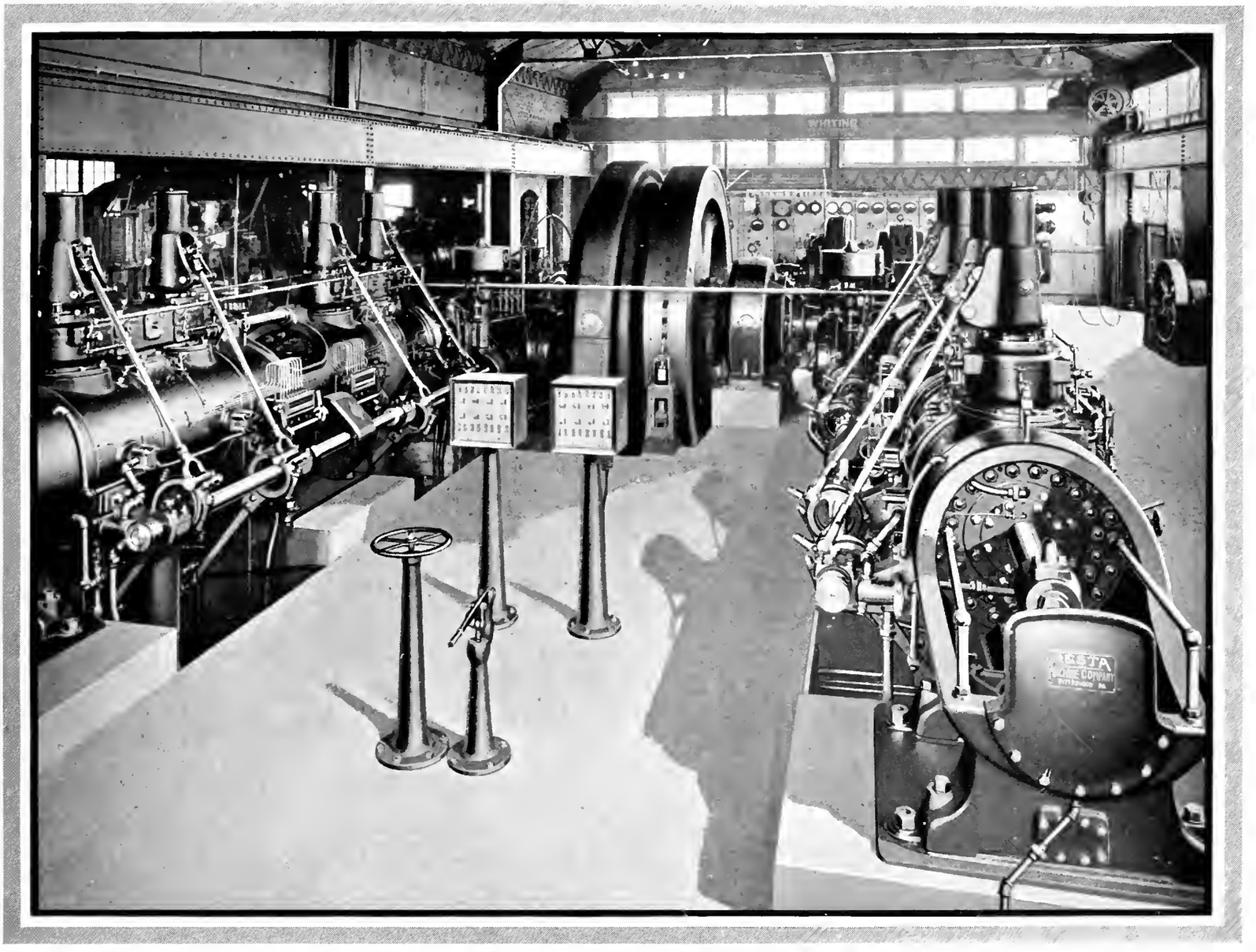
GAS POWER ENGINES

MESTA Gas Power Engines are of the four-cycle double-acting tandem type, built either in single or twin tandem units.

In the single tandem engine there is one power impulse per stroke, the same as in a single steam engine; whereas in the twin tandem gas engine, two power impulses occur per stroke, or four impulses for each revolution of the crank shaft.

These engines have been built in sizes ranging from 500 horse power to 5000 horse power, but this Company is prepared to furnish larger units if the occasion demands.

Mesta Gas Power Engines are built to operate on natural gas, blast furnace gas, producer gas and by-product coke oven gas. While the utilization of the first three named gases direct in gas engines for generation of power is quite extensive, rapid progress of late indicates that gas engines operating on by-

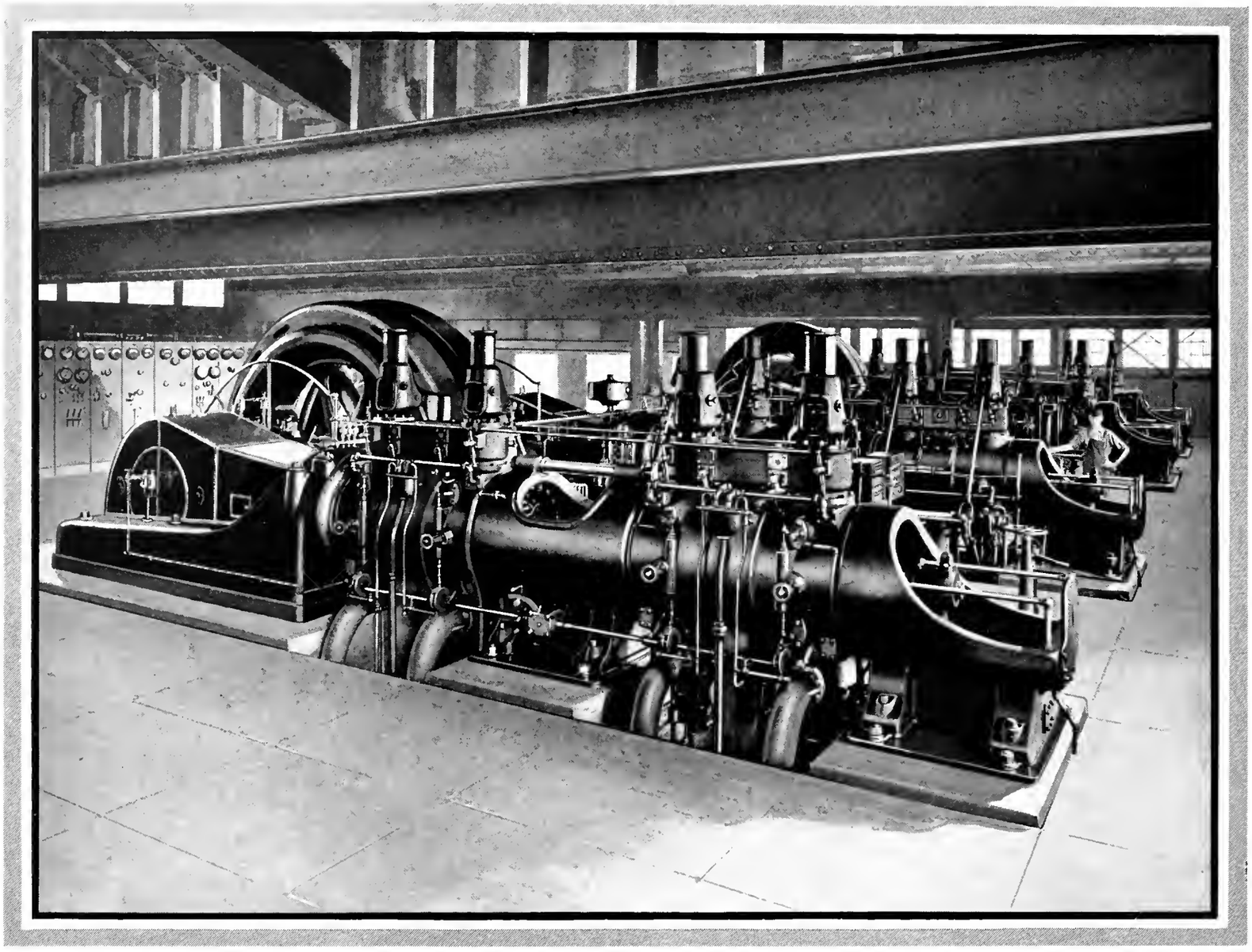


2000 H.P. Mesta Twin Tandem Gas Power Engine Operating on Natural Gas. One of Three Units Installed at The Sistersville Electric Light and Power Company

product coke oven gas are beyond the experimental stage and their reliability in operation has been conclusively proven.

At the present time there are large sums of money invested in by-product coke ovens. For each ton of coal converted into coke there is approximately 6000 cubic feet of surplus gas available for industrial purposes, having a heat value of about 500 B. T. U.'s per cubic foot after all by-products have been extracted. This surplus gas is free from impurities such as dust, tar, etc., and is suitable for use in gas engines.

The Mesta Machine Company holds the distinction of being the first manufacturer to introduce the simple governor gear, known as the "Butterfly Gear," for control of gas and air. As this gear offers very little resistance to governor control, it is possible to operate without the use of an oil relay with all of its complications.



Two 1000 H.P. Mesta Twin Tandem Gas Power Engines Operating on Natural Gas

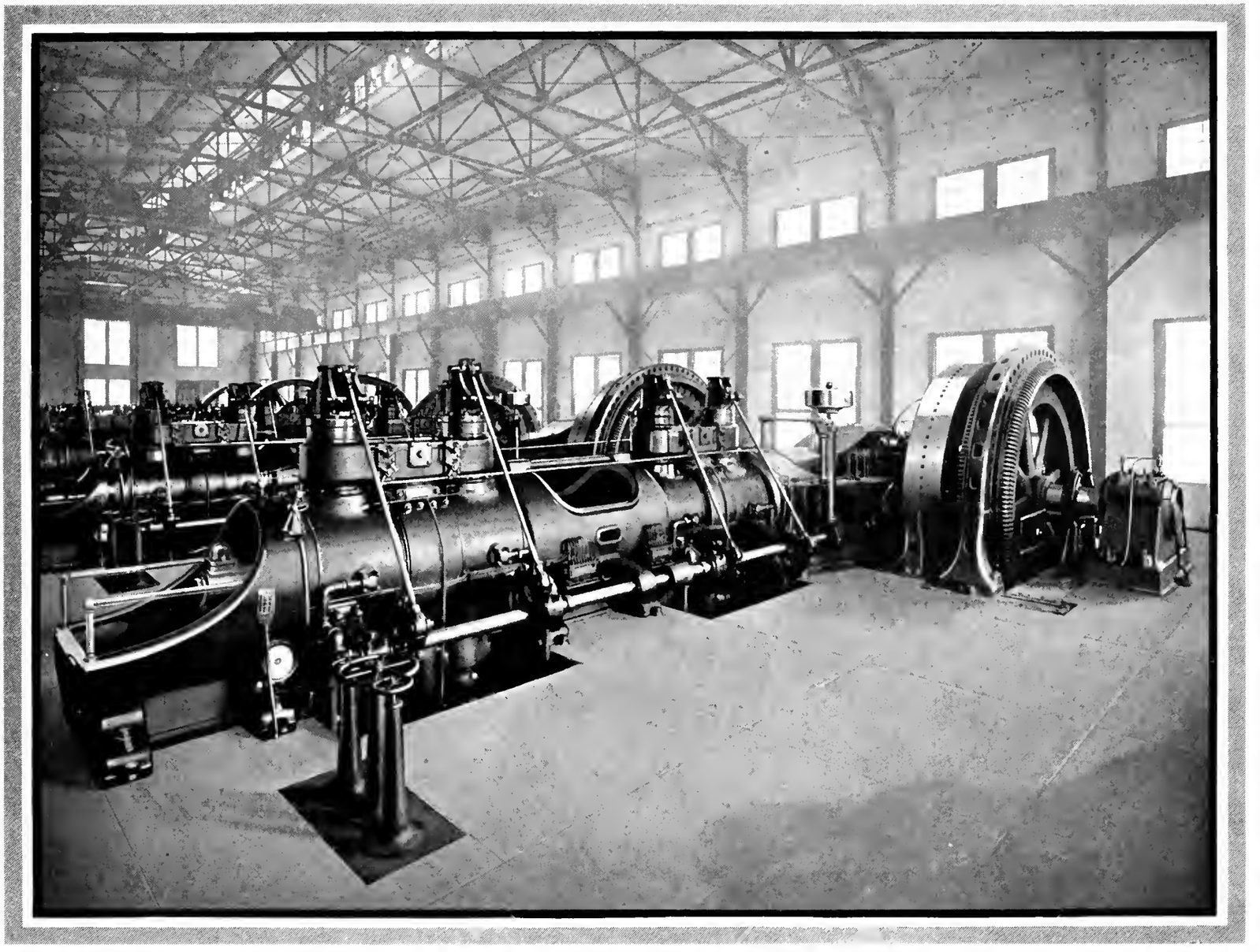
Since the governor is direct acting on the admission of gas and air, very close regulation is obtained even with extreme and sudden changes in load. This is important where gas engines are direct connected to alternating current generators operating in parallel.

The illustration on this page shows a number of Mesta Gas Power Engines which successfully operate in parallel under the most severe conditions of load. These engines are direct connected to 60-cycle alternators furnishing power for a street railway system where the load fluctuations are extremely heavy.

The principal methods employed in regulation of large gas engines may briefly be mentioned as follows:

Quality Regulation– in which the ratio of gas to air varies according to changes in load, while the total volume admitted is kept constant.

Quantity Regulation—in which the



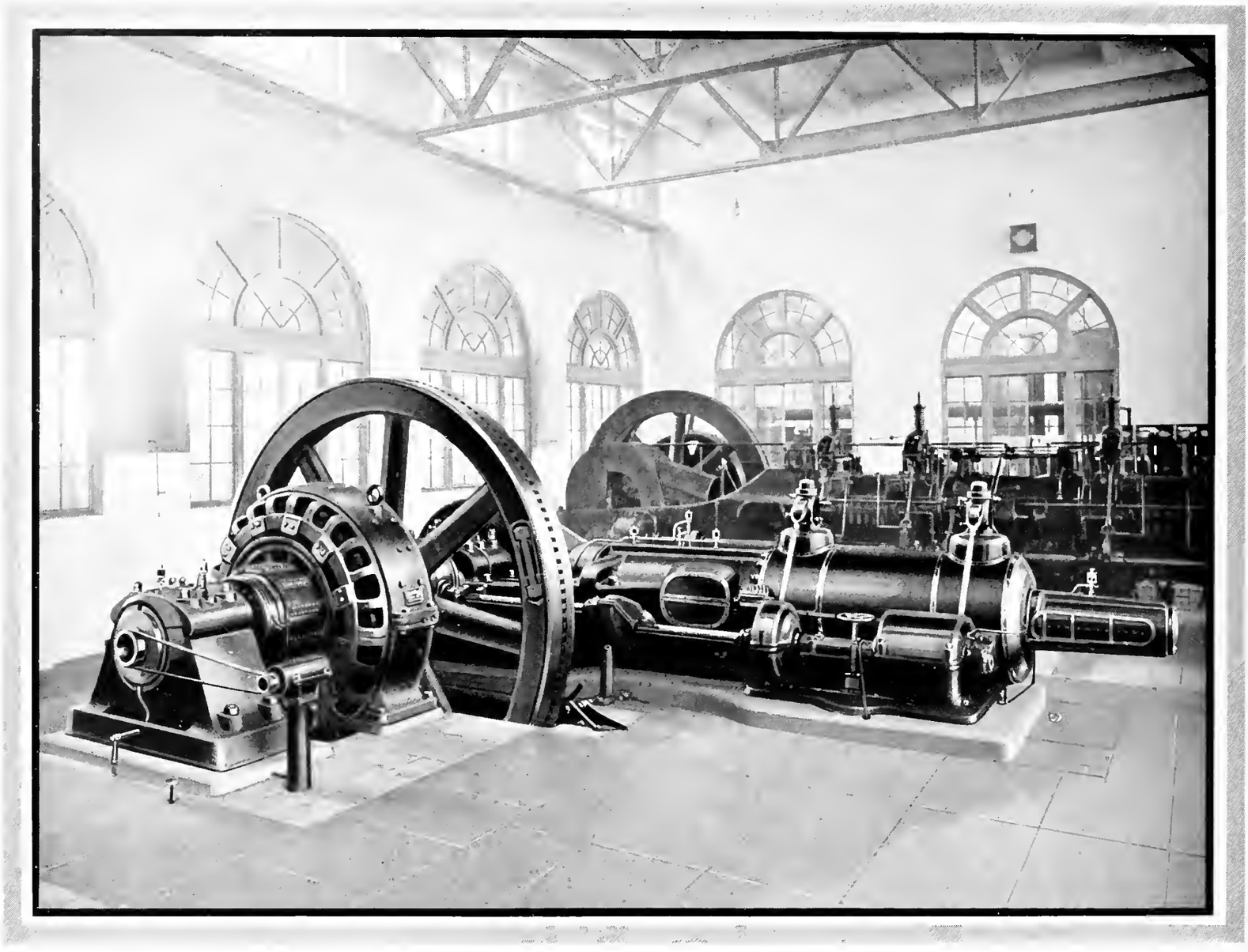
2400 H.P. Mesta Single Tandem Producer Gas Power Engine

ratio of gas to air is kept constant throughout the whole range of load, while the total volume is varied.

Combined Quality and Quantity Regulations—in which the ratio of gas to air varies during the higher ranges of load and the ratio of gas to air is kept constant during the lower ranges of load.

While space does not permit any discussion of the theory underlying the advantages and disadvantages of these various methods of regulation, actual experience has proven that maximum efficiency is obtained by the "Combined Method."

The Mesta Patented Valve Gear is designed primarily for the "Combined Method" of regulation and is set to give maximum efficiency under normal operating conditions. The operator may, however, by a slight adjustment change the method of regulation from "Quantity" to "Quality" or any combination in between if conditions demand.



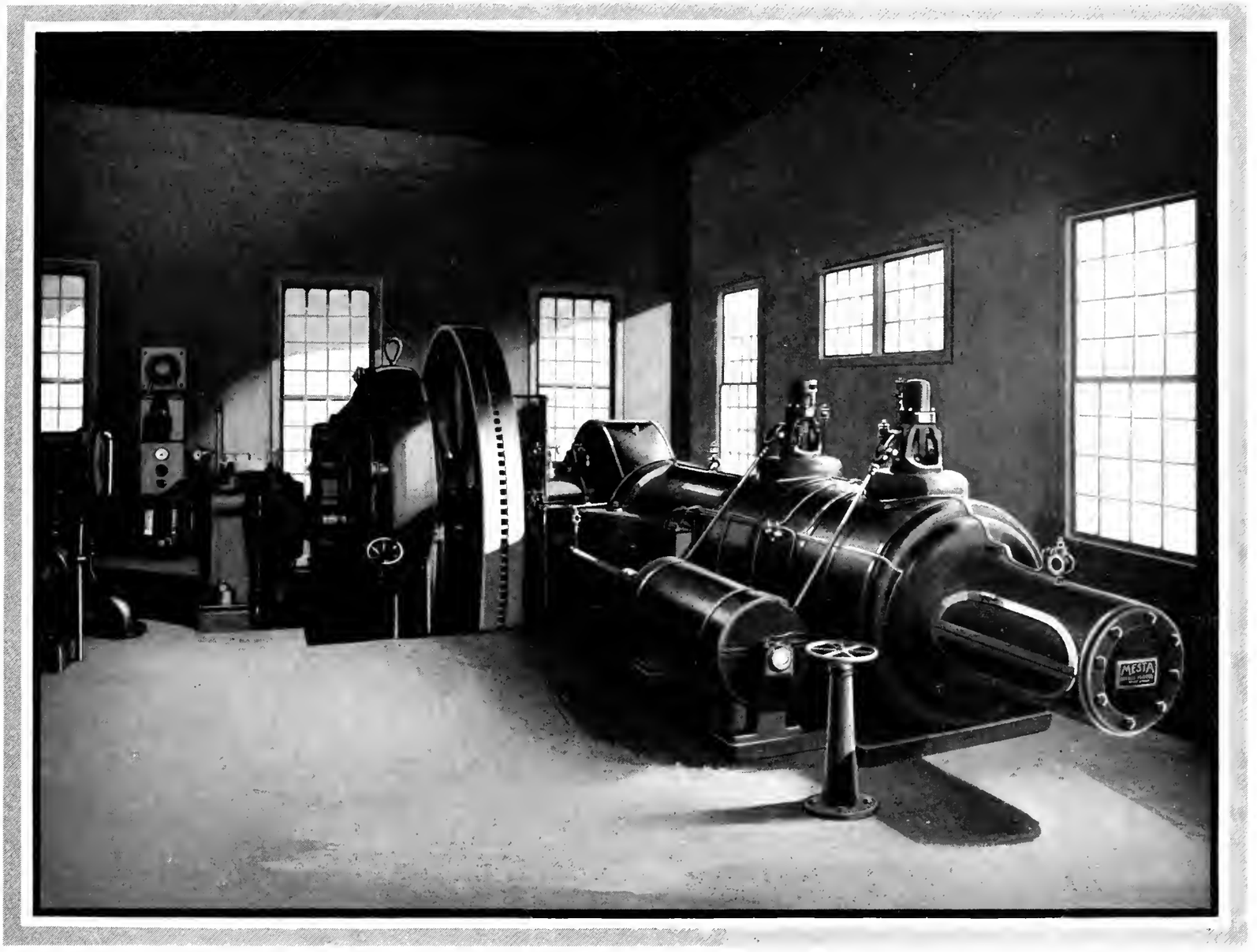
28″x42″ Mesta Una-Flow Steam Engine Installed in the Power Plant of The Carnegie Institute of Technology

UNA-FLOW ENGINES

THE "Una-flow" or "Direct-flow" engine while comparatively new in the United States has been used successfully in Europe for more than ten years. The Mesta Machine Company has been granted an exclusive license in the United States for building Una-flow engines for driving rolling mills and also a license for building this type of engine for other purposes.

As the name "Una-flow" implies, the flow or energy of the steam always passes in one direction through the cylinder and does not return as in the case of the "Counter-flow" type, such as Corliss and piston valve engines.

The steam enters through admission valves of the poppet type arranged one at each end of the cylinder. The exhaust valves are merely ports located at the center of the cylinder, the opening and closing of which is controlled by the piston. The steam after expanding is exhausted as soon as the piston



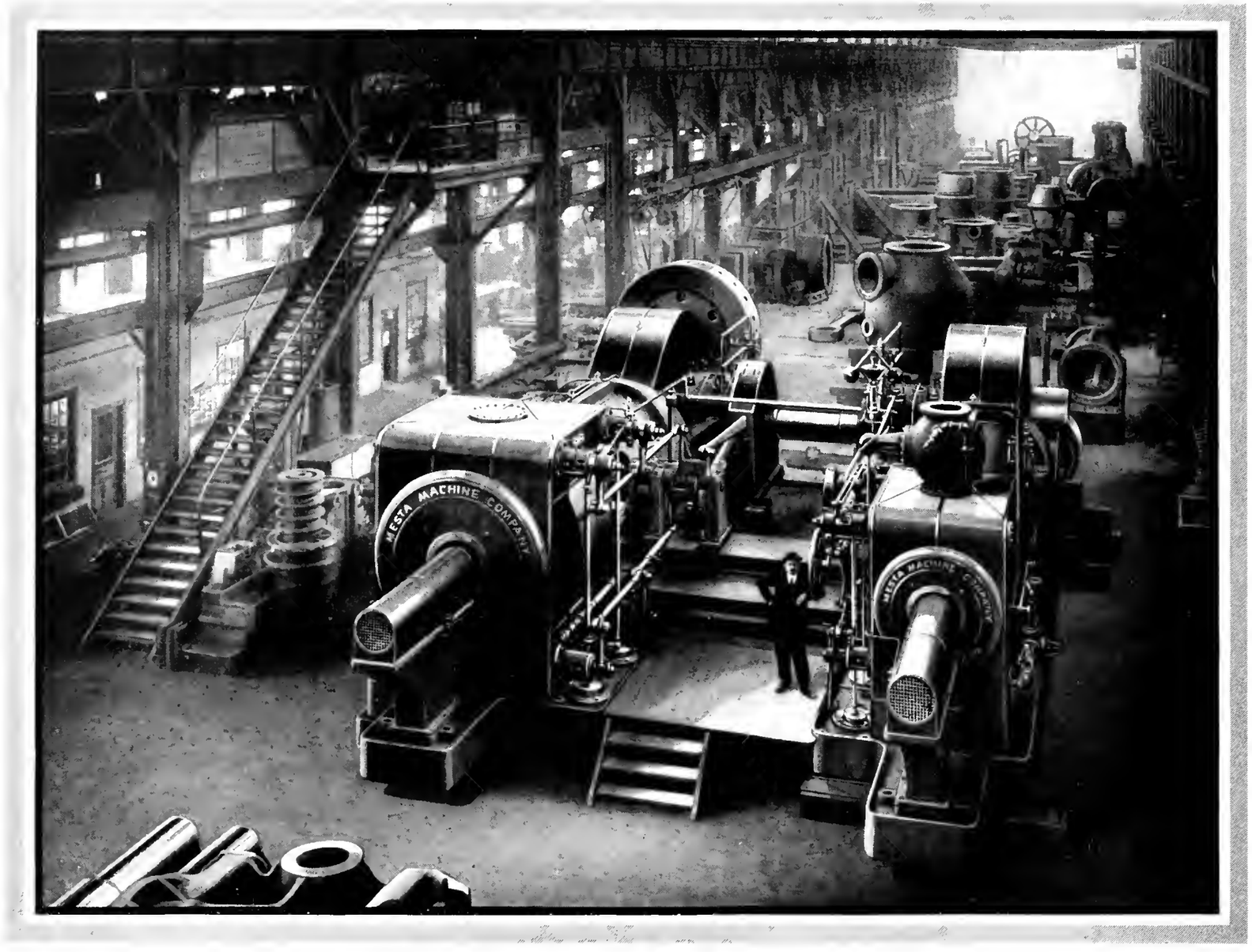
One of Two 36″x42″ Mesta Una-Flow Steam Engines Installed in the Power Plant of The Mesta Machine Company

uncovers these ports, which reduces the cylinder condensation to a minimum and results in a very low steam consumption; in fact, this type of engine has a lower steam consumption than any compound engine operating under the same conditions.

Due to the absence of exhaust valves, the valve gearing is confined to two inlet valves which are operated by eccentrics on a lay shaft driven by means of gears from the main shaft of the engine. A powerful and sensitive governor insures steady regulation.

The poppet type of inlet valve permits the use of high steam pressures and superheat and a steam consumption as low as 10 pounds of steam per I. H. P. per hour is readily obtained in condensing operation.

Due to its uniformly high economy and simplicity of construction, the Una-flow engine is ideal for rolling mill service.



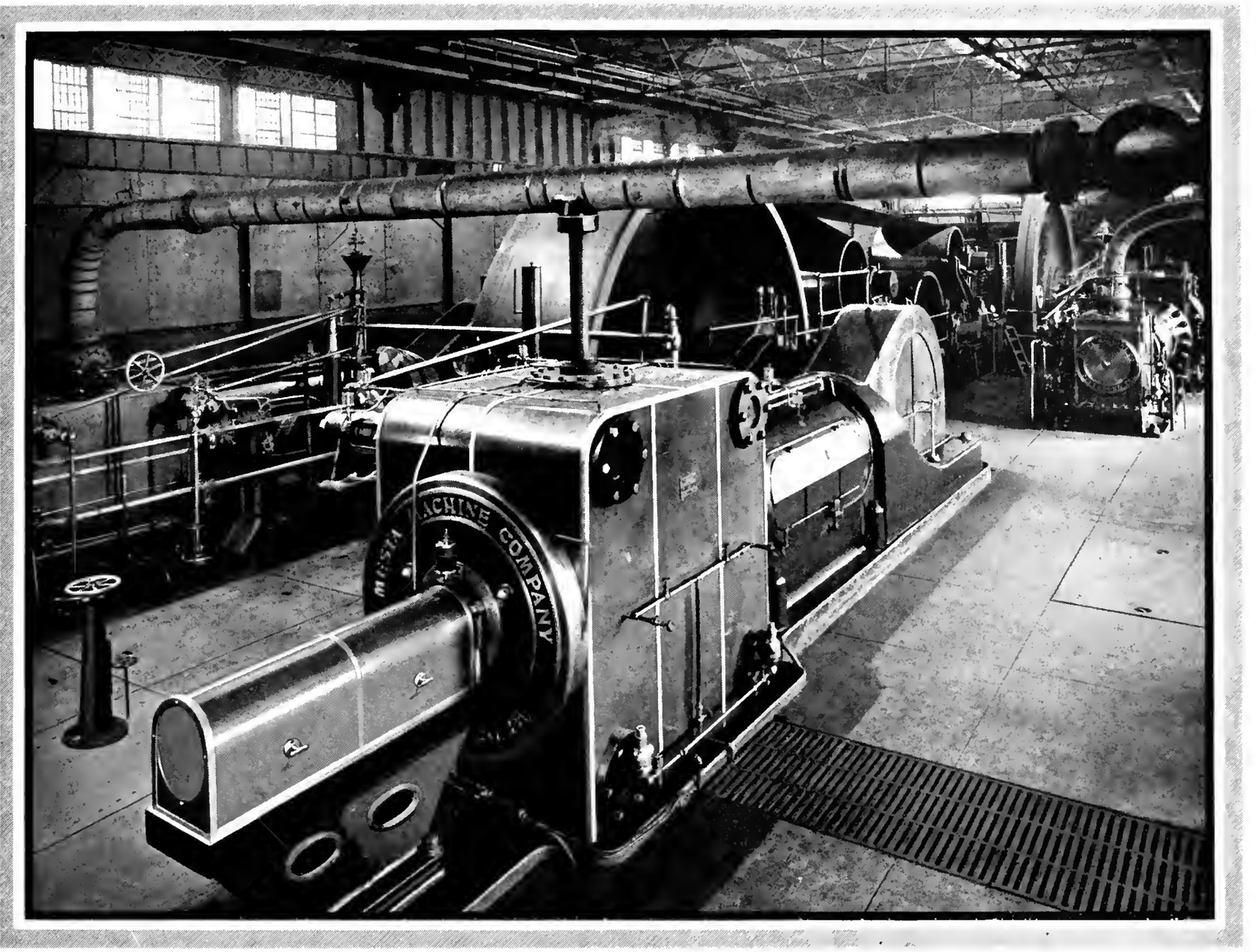
48″ and 84″x60″ Cross Compound Corliss Mill Engine on Erecting Floor

CORLISS ENGINES

THE type of engine, which during the past twenty-five years has reached a high stage of perfection and which still compares favorably with the more modern types of steam engines, is the Mesta Corliss Engine, a large number of which have been built by this Company for various kinds of service. On account of its strictly heavy duty construction, this engine is especially adapted for rolling mills.

All stationary parts are heavy and rigid, while the reciprocating parts are made light, but strong, with extra large wearing surfaces.

The valve motion is simple to the extreme, being of the "Mesta Straight Line" type that eliminates all complicated wrist plates with their jerky valve motion and the trouble incident thereto caused by excessive strains in the connecting parts. On account of the small number of moving parts, this valve motion operates quietly and



Installation of Mesta Corliss Engines and Belt Drives for Continuous Mills at The Lackawanna Steel Company

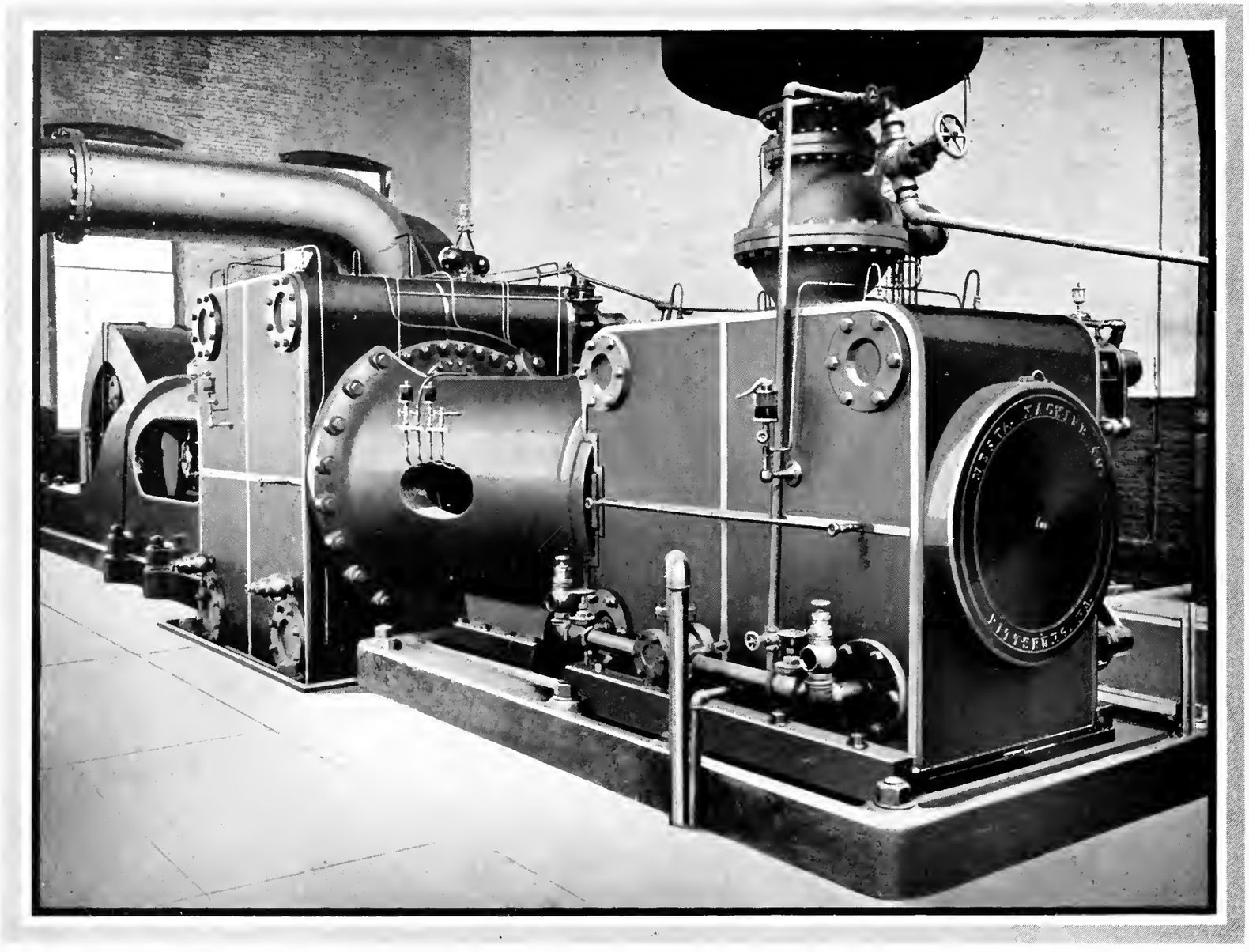
requires very little attention.

Another distinct feature of this straight line valve motion is the fact that it is especially adapted for long range cut-off, most essential for engines working under wide fluctuations in load.

A powerful and sensitive governor for the purpose of securing stable regulation is used and which has fulfilled perfectly the most exacting requirements; such as driving alternators in parallel and on engines direct connected to a modern high tonnage rolling mill where wide fluctuations in load must be contended with.

The main and outboard bearings, crank pins and crosshead pins are made amply large to prevent any possibility of heating, and with ready adjustment provided for taking up the wear. The Tangye type of bedplate with bored guide is used exclusively.

Rolling mill engines are equipped with a hand operated reversing gear for



38″ and 72″x60″ Mesta Tandem Corliss Engine Installed at the Plant of The Inland Steel Company

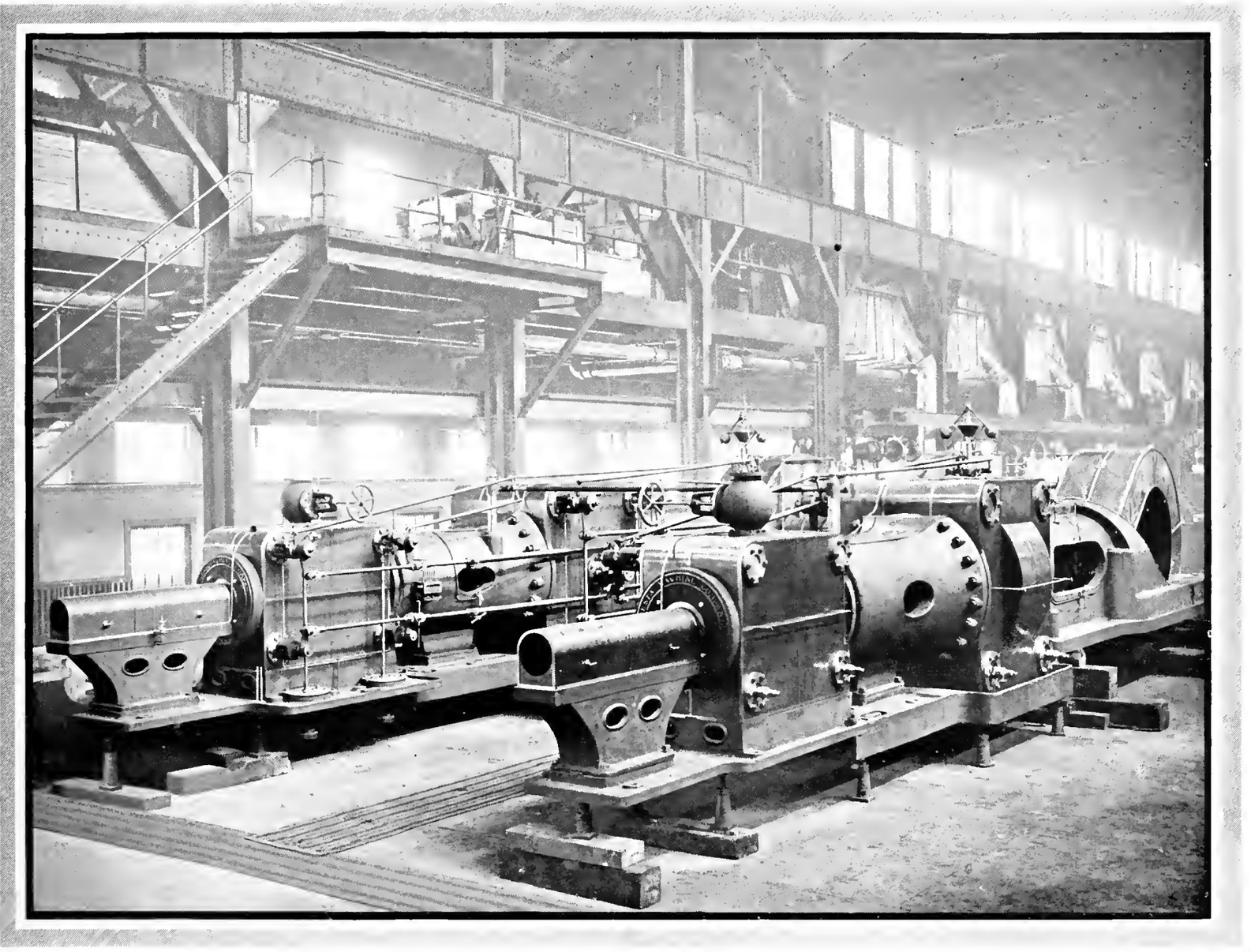
the purpose of reversing the engine when it is necessary to back a piece out of the mill.

Mesta Corliss Engines are designed for steam pressures ranging from eighty to one hundred and eighty pounds and for superheat up to seventy-five degrees Fahrenheit. They are built in simple and compound units to run condensing or non-condensing and of the horizontal or vertical type.

The driving arrangement can be direct, geared, belted or by means of ropes, depending upon the character of the machinery to be driven.

Among the various classes of service for which Mesta Corliss Engines have been built and have operated most satisfactorily may be mentioned, rolling mill engines, power engines, blowing engines, air and gas compressors, pumping engines and vacuum pumps.

In the manufacture of Mesta Corliss Engines air furnace melted cast iron of



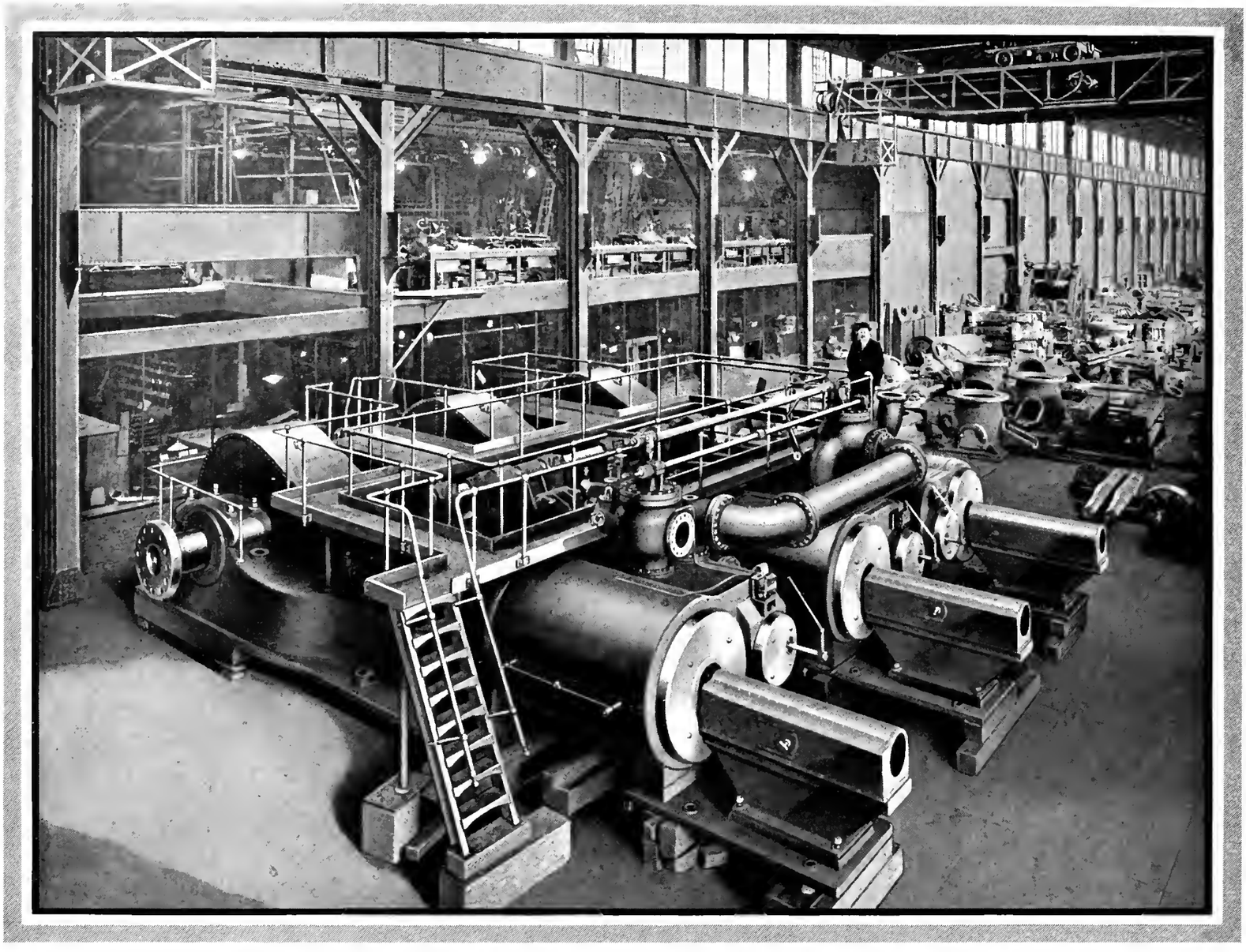
34″ and 60″x60″ Twin Tandem Compound Corliss Engine on Erecting Floor

high tensile strength is used exclusively. The cylinders are made of a special mixture of air furnace melted cast iron which is hard and close grained and has exceptional wearing qualities.

The shafts, piston rods, connecting rods and pins for these engines are made of acid open hearth steel forged under presses and carefully annealed to remove any initial strains that may have been set up by unequal cooling during the forging process.

Under actual working conditions, Mesta Corliss Engines have shown as low as 23 pounds per indicated horse power per hour for simple non-condensing, 18 pounds for simple condensing, 17 pounds for compound non-condensing and 13 pounds for compound condensing.

The unqualified success of the Mesta Corliss Engine has been attributed to its reliability, simplicity and low operating cost.



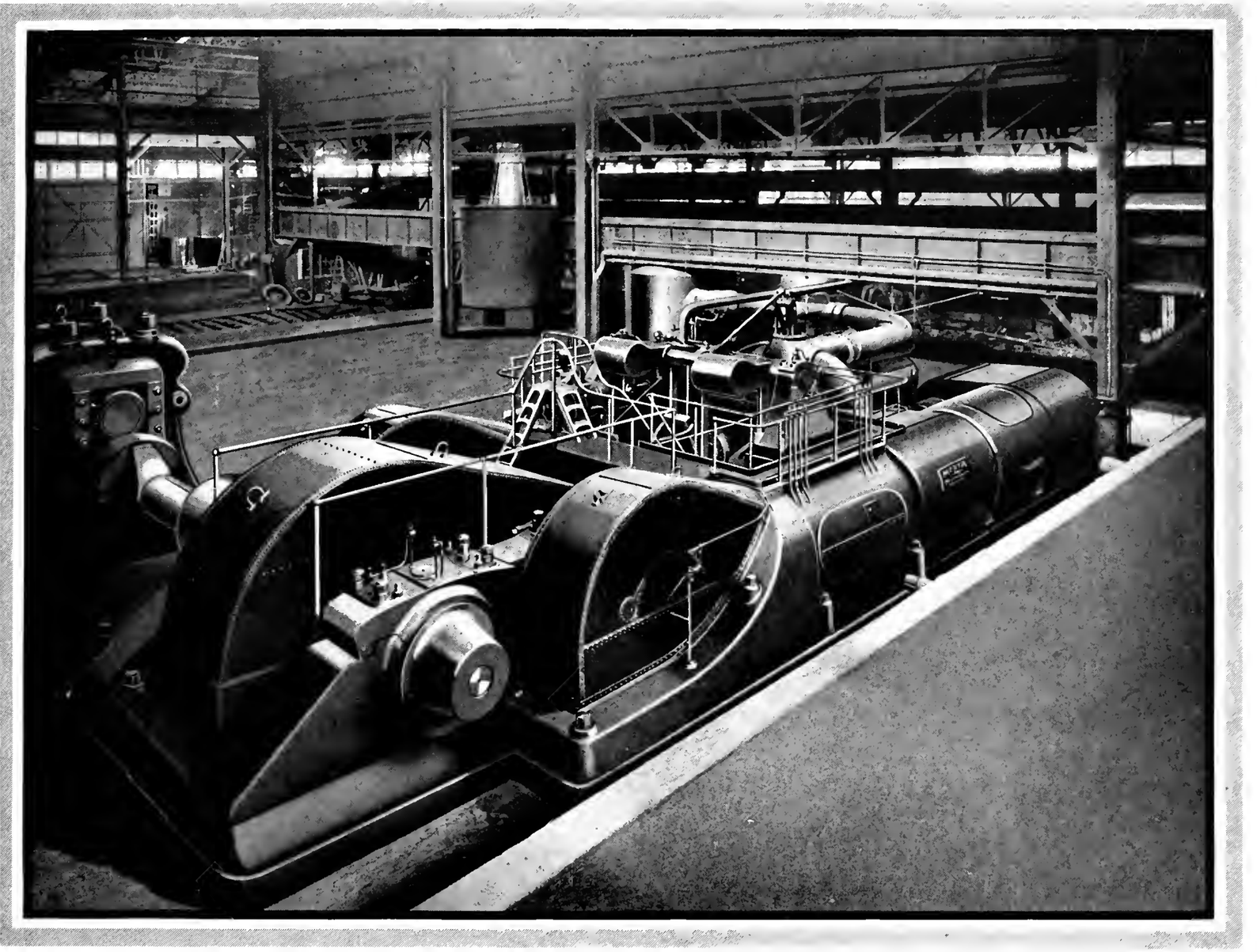
44″ and 44″ and 44″x48″ Triple Cylinder Reversing Engine on Erecting Floor

REVERSING ENGINES

THE Mesta Machine Company was among the first in the United States to build Reversing Rolling Mill Engines for driving Two-high Rolling Mills, either by driving directly from the crank shaft of the engine or through gears and countershaft.

Until recent years, the Simple Twin Cylinder Non-condensing Reversing Engine was used almost exclusively and a large number of these engines, built by this Company, can be seen in operation in numerous Rolling Mill Plants.

When greater economies were demanded, the Mesta Machine Company developed their compound type of Reversing Engine. The heavy, rugged construction, the simplicity of valve gear and the single lever control have made it, by far, the most successful engine of its kind. This statement is substantiated by the fact that this Company has built all of the Reversing Engines of this type, as well as other



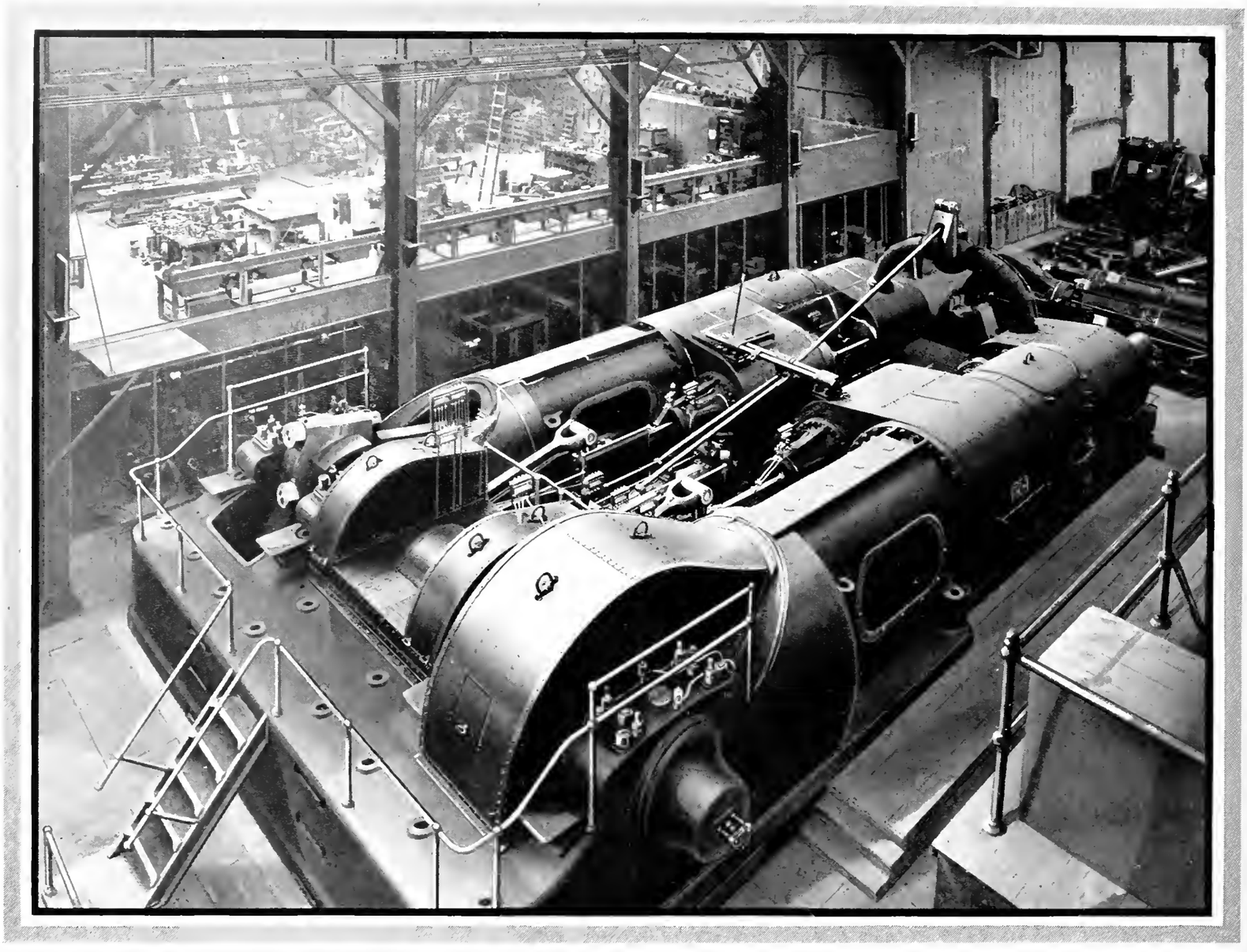
46" and 70"x60" Mesta Twin Tandem Compound Reversing Engine Driving Plate Mill at The Lukens Steel Company

types, which have been installed in this country in recent years.

The valve gear is either of the Stevenson or Allen type, driven from eccentrics on the main shaft. The drive is direct from eccentrics to valve rods with no rockers and intermediate links interposed. Eccentric rods are bolted directly to the eccentric straps.

The "Single Lever Control" controls the link reversing mechanism and this in turn controls the throttle, so that the cut-off varies according to the load and speed, practically the same as if the links were under the control of a variable speed governor. This method of control has resulted in a great saving of steam, and a steam consumption as low as 20 pounds per horse power per hour is easily obtainable.

Piston valves with self-adjusting packing rings and floating pistons in the main cylinders are used exclusively. The reciprocating parts are made very

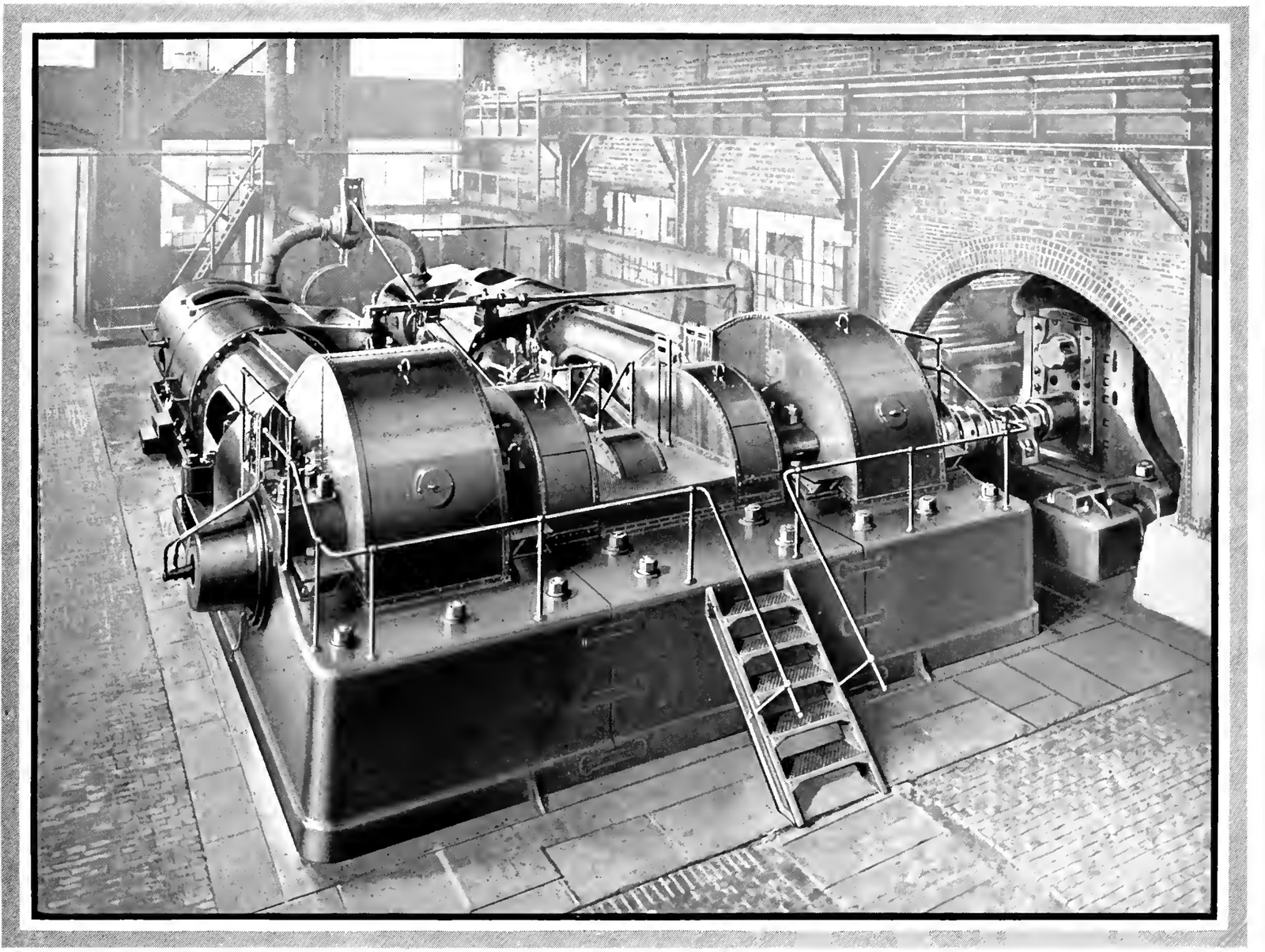


Twin Tandem Compound Reversing Engine on Erecting Floor

light, though in no case to such an extent as to impair the strength of these parts. Wedge adjustment is used on all main crossheads and slippers as well as for the bearings, and all parts are accessible for inspection without requiring dismantling of parts of the engine. Receivers between high and low pressure cylinders are made very small, consisting only of liberal size connecting pipes for the free passage of the steam from high pressure to low pressure cylinder.

No low pressure throttle valves are employed, but the steam valves in the low pressure cylinder close off the steam between the receiver and the low pressure cylinder when the links are centered and the engine stopped.

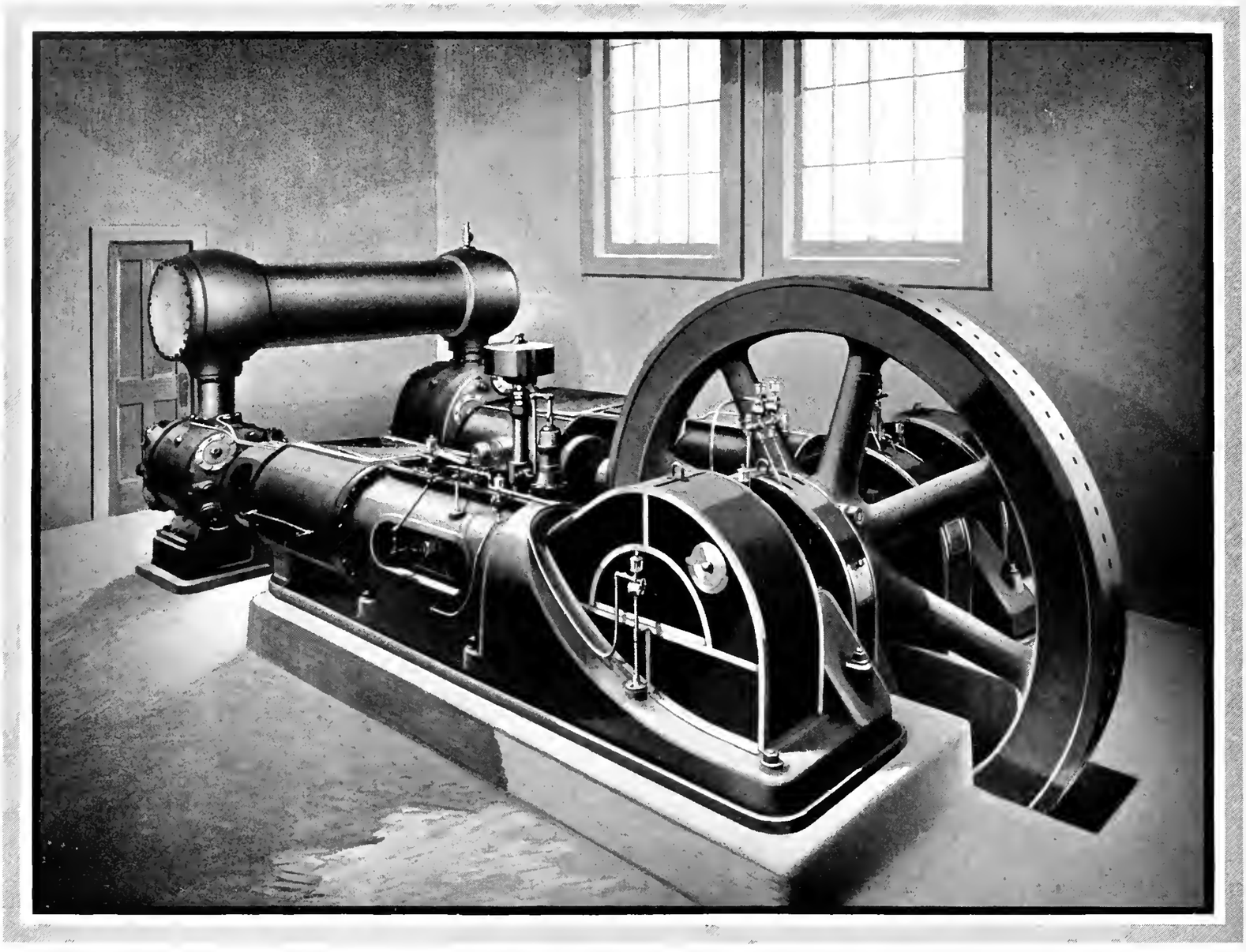
Mesta Reversing Engines can be reversed very quickly; in fact, in less than one-half the time required by an electric reversing motor of the same horse power.



46″ and 76″ x 60″ Mesta Twin Tandem Compound Reversing Engine Installed at The McKinney Steel Company

The aiming at simplicity to the greatest possible extent has not, however, led to the omission of any refinements such as safety devices, oil guards and lubricating system; all engines are equipped with a most complete lubricating system with special lubricating devices for lubricating moving parts. The engines are very economical in the use of oil, as the lubricating system is continuous and automatic; all waste oil is collected, filtered, and used again.

This Company is prepared to furnish Reversing Rolling Mill Engines of any type, such as Twin Cylinder, Three Cylinder High Pressure or Three Cylinder Compound, Twin Tandem Compound or Three Cylinder Tandem Compound, either for driving the mills direct from the engine shaft or through gears and countershaft. The compound type is especially suitable for the highest practical steam pressure, super-heat and vacuum conditions.



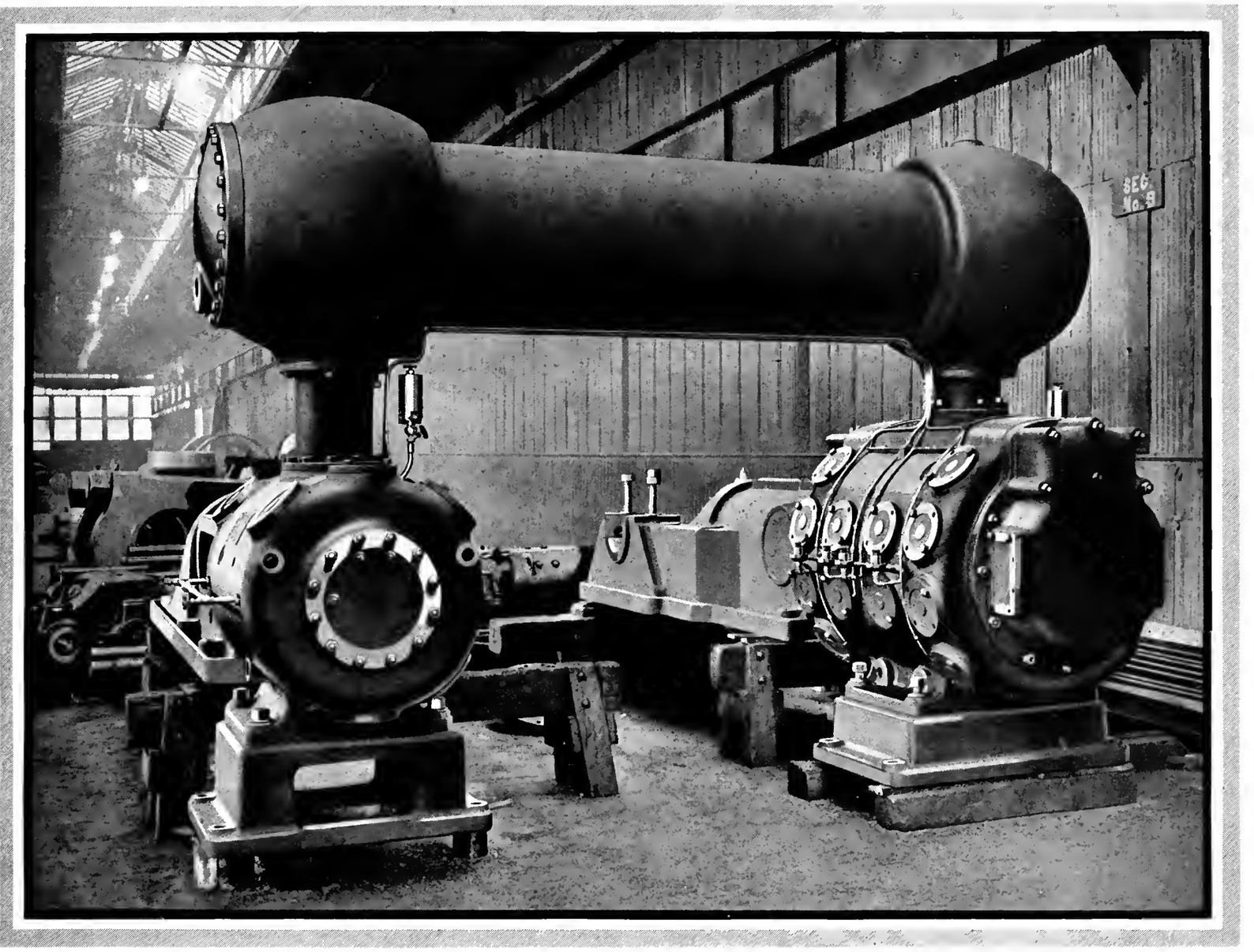
24″ and 40″ and 38″ and 22″ x 30″ Mesta Two-Stage Air Compressor

AIR COMPRESSORS

AIR Compressors up to the largest sizes are included in the standard line of machinery manufactured by the Mesta Machine Company. The Direct Steam Driven Air Compressor is built along the same lines of heavy, rugged construction as the Mesta Steam Engines.

The above illustration shows a Compound Steam Engine Driven Two-Stage Compressor with Automatic Double Piston Steam Valve Gear and with air cylinders equipped with Mesta Automatic Plate Valves. The steam valve gear is under the control of a constant air-pressure automatic volume regulator, which automatically varies the speed of the engine according to the demand for air.

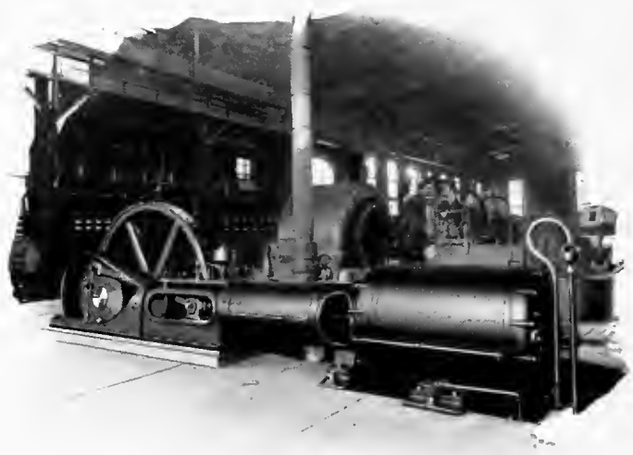
Steam-Driven Air Compressors with Corliss valve gear, as well as gas and power-driven compressors with single, double, three and four-stage compression, are built for pressures up to 1000



Motor-Driven Two-Stage Air Compressor on Erecting Floor

pounds per square inch or more. All Compressors are equipped with Automatic Plate Valves and the power-driven machines are equipped with an automatic unloading device.

The automatic unloading device acts on the intake valves of both high and low pressure cylinders. By holding the inlet valves open, as soon as the predetermined pressure is reached, the compressor cylinder churns cold air. The method of unloading the machine by holding the inlet valves open also has the effect of cooling the cylinders, as both the high pressure and low pressure cylinder valves are held open simultaneously while the intercooler pressure is kept constant. On smaller size power-driven machines single or two-step control is used, while on the larger sizes the four-step control is used. The illustration on this page shows a 3000-foot motor-driven machine with four-step control.



14″ and 46″ x 36″ Mesta Dry Vacuum Pump

BAROMETRIC CONDENSERS AND VACUUM PUMPS

THE Mesta Barometric Condenser is of the counter-current type in which the air is extracted from the coolest part of the condenser vessel, giving a higher vacuum than can be obtained with any other type of barometric condenser.

The Condenser is built entirely of cast iron and there are no internal bolts or braces; likewise no spray nozzles or perforated plates which can become clogged. The Mesta Condenser will maintain its highest efficiency practically indefinitely.

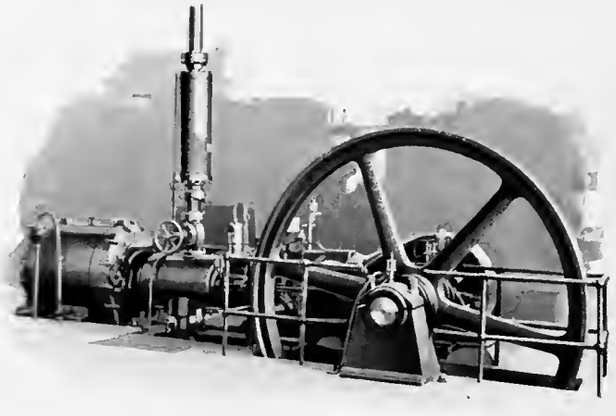
For the liberation of air in the cooling water, two cascades are formed in the condenser head by means of weirs and splash plates. Below the cascades is one long waterfall for condensation. At the bottom of this waterfall openings in the water sheet are provided for the purpose of allowing the air and part of the vapor to reach the center of the condenser and then to be extracted by the pump.

The thickness of the water sheets is such that no uncondensed steam can reach the top of the condenser, but on the other hand there is no resistance to the flow of air to the top of the condenser.

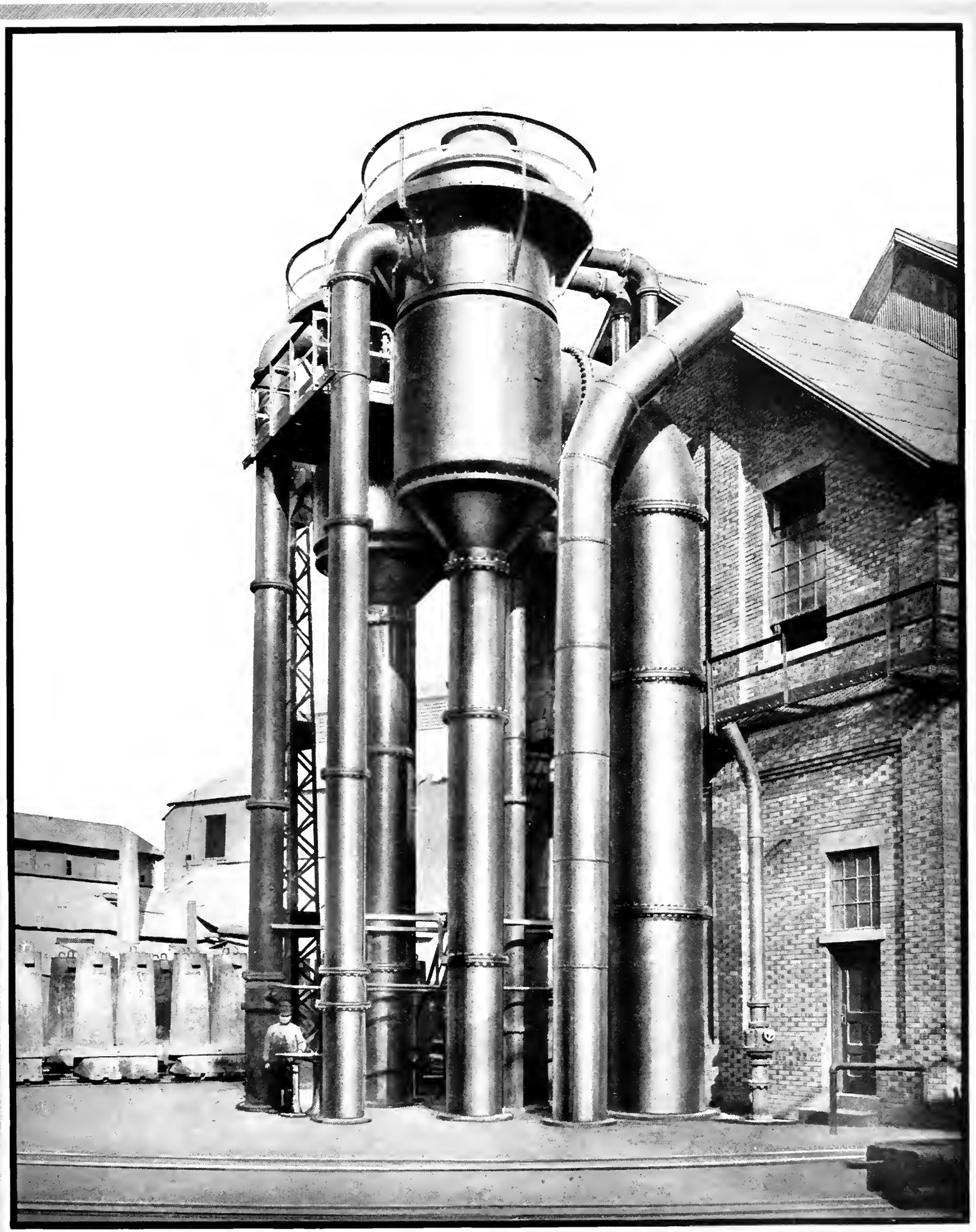
The patented water-sealed free exhaust is attached to the tail pipe just below the surface of the water in the hot well. This free exhaust contains no mechanical parts, is entirely automatic and cannot leak air into the condenser.

The Mesta Rotative Crank and Flywheel Type Dry Air Pump is of heavy duty construction and most reliable and efficient in operation. The air cylinder is equipped with Mesta Automatic Plate Valves for both inlet and outlet and will give a vacuum within .4 inch of the barometer against a closed suction.

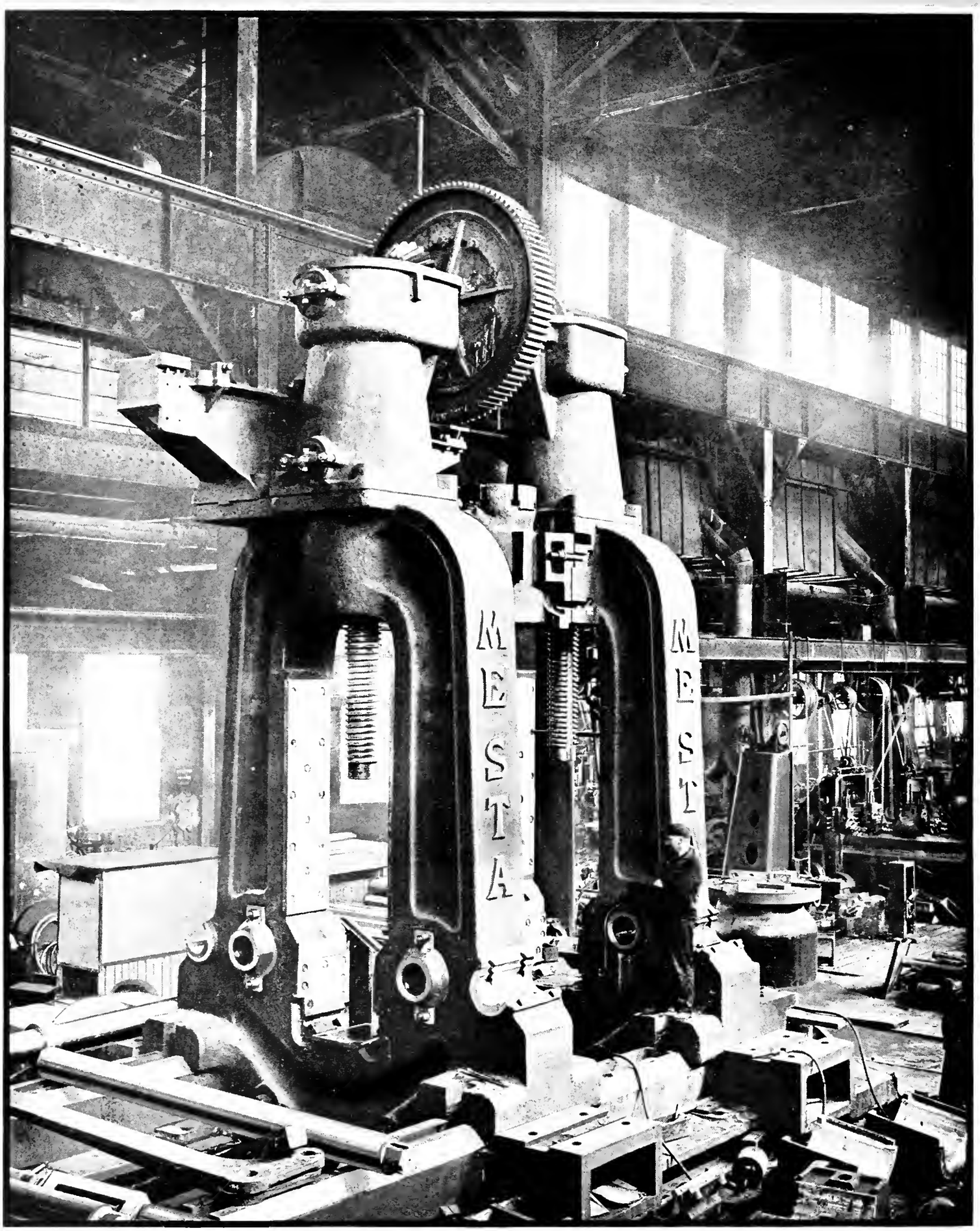
Many large Rolling Mills, Blast Furnaces, Steel Plants and Power Plants are using Mesta Barometric Condensers and Dry Air Pumps, ranging in capacities from 10,000 to 400,000 pounds of steam condensed per hour. These condensers, under favorable conditions, maintain better than 29 inches of vacuum referred to 30 inches barometer.



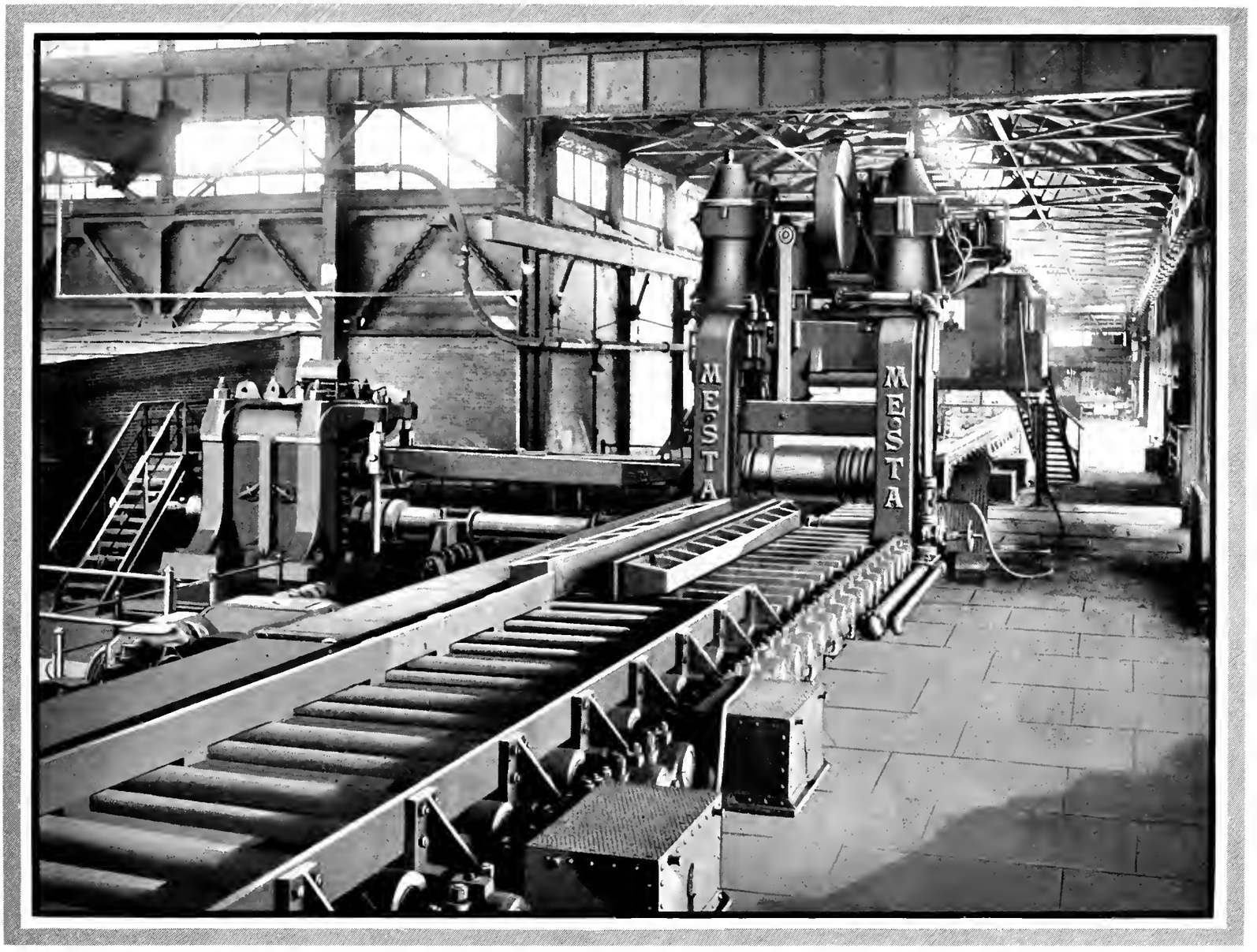
14″ and 34″ x 24″ Vacuum Pump



Two 96″ Mesta Barometric Condensers Installed at the New Castle Works of The Carnegie Steel Company



40" Blooming Mill on Erecting Floor



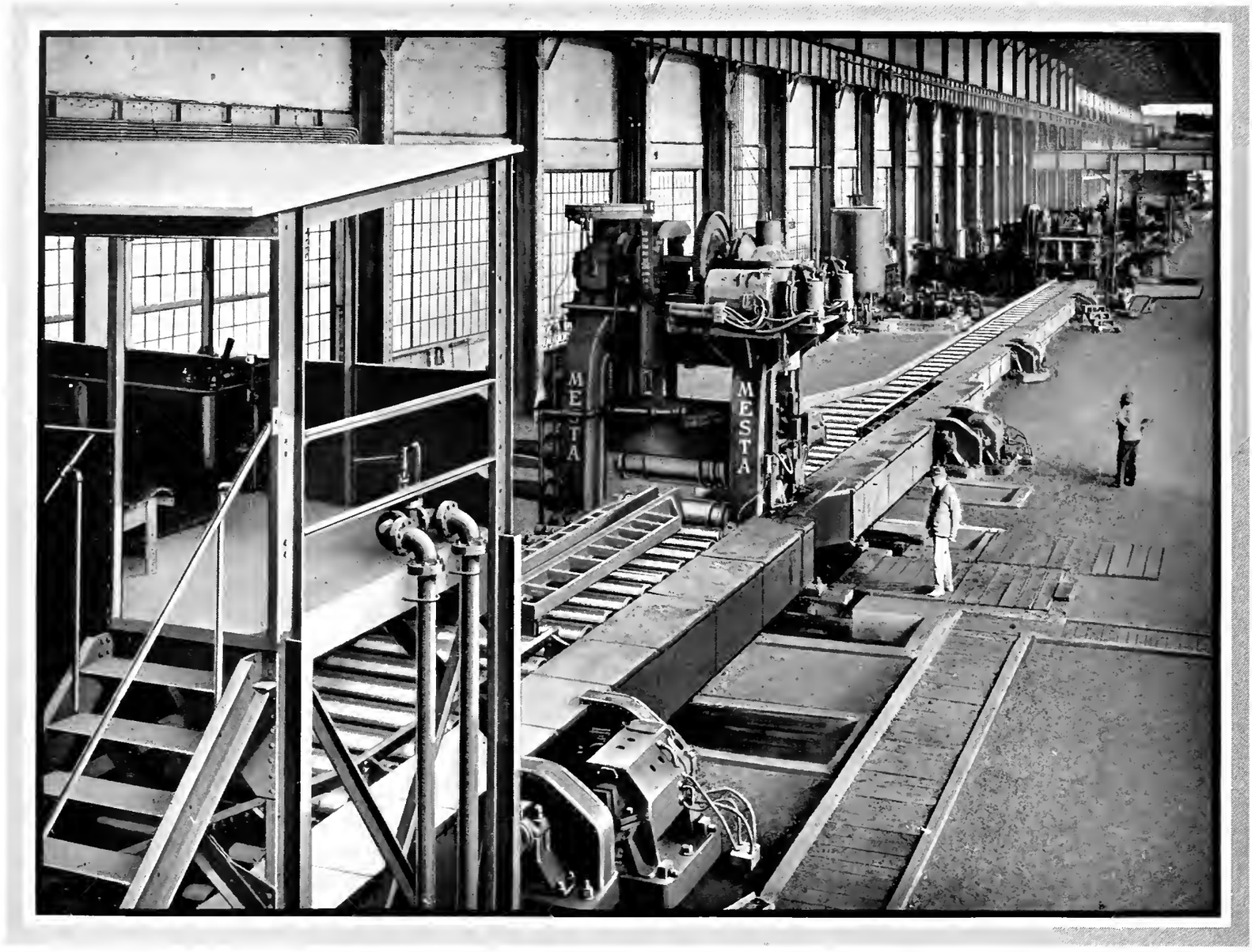
40″ Mesta Blooming Mill and Equipment Installed at the Lorain Works of The National Tube Company

BLOOMING MILLS

MESTA Two-High Reversing Blooming Mills are built along the most modern lines. Rigidity of construction, simplicity in detail, accessibility of all parts and provision for quick roll changing are important features which have been taken care of in the design and construction of these mills to the greatest possible extent.

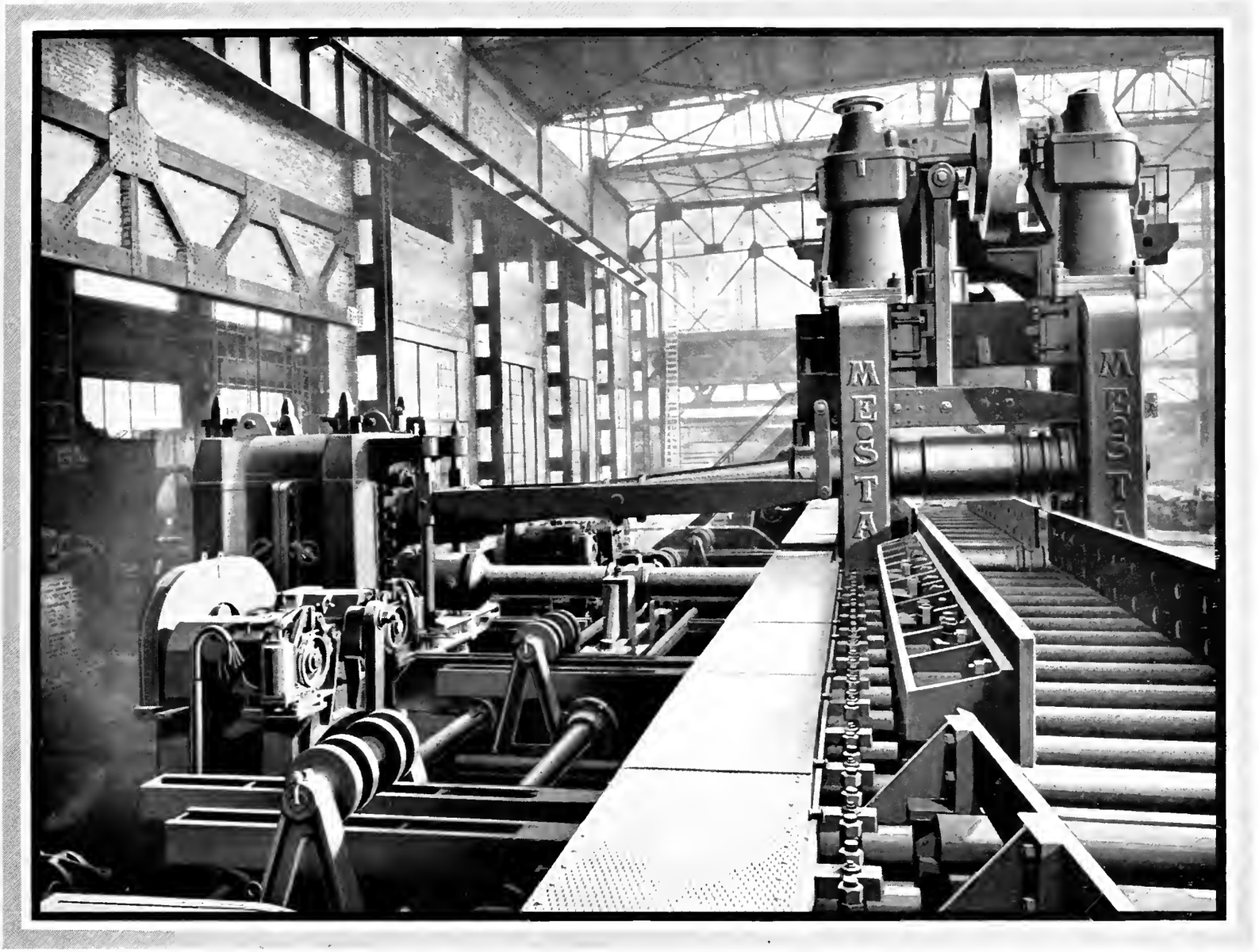
The Mesta Patented Full Universal Spindles, the electrically-operated Screw-down, the electrically-operated Manipulator, solid enclosed Pinion Housing, Double Helical Cut Pinions, Machine Cut Steel Gears throughout, the Table Girder construction with all Table Gears running in oil and the most carefully constructed safety appliances are important features in evidence throughout in a Mesta mill.

The Roll Train, comprising the Roll Stand, Pinion Stand and Spindles, is mounted on heavy continuous cast iron or steel shoe plates. Closed-top roll



34" Mesta Blooming Mill and Equipment Installed at the Plant of The Central Steel Company

housings made of cast steel are used exclusively. The distribution of the material in steel housings insures greatest strength for a given weight, and freedom from internal strains. The windows in the roll housings are planed and lined with rolled steel wearing plates secured to the housings by through bolts. The feet of the housings are planed to fit the shoe plates. Housing fillings for the housing windows present large bearing surfaces and are so made that they can easily be removed and replaced if necessary. Provision is made for aligning the rolls in a most convenient manner. The table rollers in the housings are close to the main rolls, but are easily removable. The screw-down mechanism, electrically operated with two motors in series mounted on a heavy casting on top of the roll housings is of the spur and bevel gear type with large screws working in housing nuts made of best

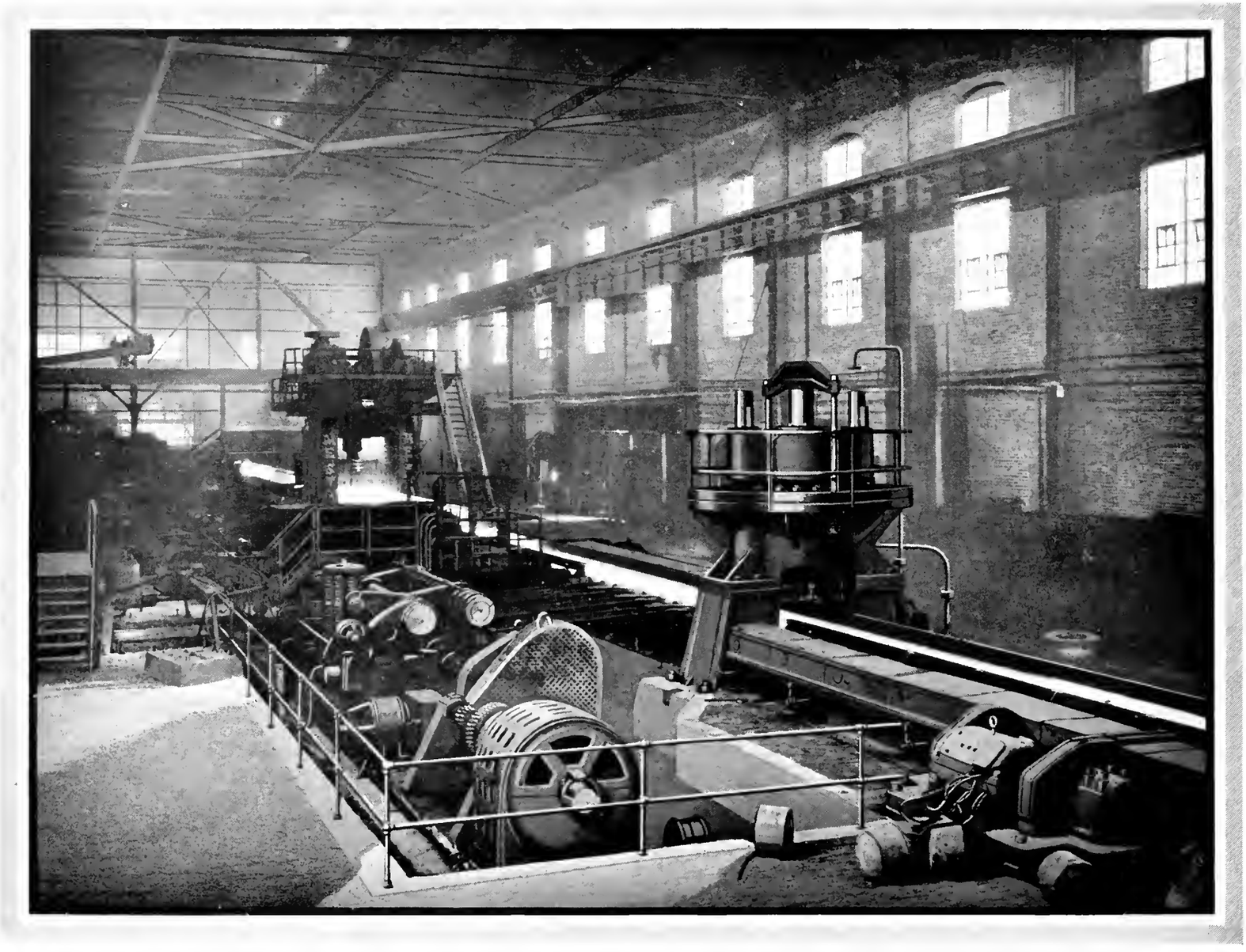


40" Mesta Blooming Mill and Equipment Installed at the Sparrows Point Works of The Bethlehem Steel Company

quality bronze. Oil-tight and dust-proof housings are provided for the screws and for the gearing. Stairways, platforms, and railings form means for a most convenient and safe attendance of all machinery on top of the roll housing.

The Pinion Housings are entirely enclosed with double helical cut pinions running in oil. Extra large pinion necks are provided and best possible means of lubrication of the babbitt-lined bearings reduce wear and replacements to a minimum.

The Spindles containing the Mesta Patented Universal Joint are carried by suitable spindle carriers, the design of which is clearly seen in the illustrations. The spindles contain the oscillating parts of the universal joint, which are closely fitted so that there is practically no back lash. All Mesta mills are remarkably quiet in operation even at the highest speeds or with quickest



40″ Mesta Blooming Mill and Equipment Installed at the Gary Works of The Illinois Steel Company

reversals and with maximum load. Absence of noise is also attained by the balancing of the upper roll which in the Mesta Blooming Mill is effected by hydraulic pressure. The hydraulic balancing arrangement is clearly shown in the illustrations. Rolls can be changed without disturbing spindles or housing fillings.

The Mill Tables are of the most substantial construction, with table beams made of cast steel forming a continuous oil trough for the table gears. Ring oiling is provided for the journals and heavy sectional gear covers provide a continuous foot walk along the tables. Gear covers can be removed with a crane without loosening any bolts.

The Manipulator is electrically operated. The finger and side guard type is used for manipulating the piece on the tables. Side guards extend up between the roll housings close to the rolls. All

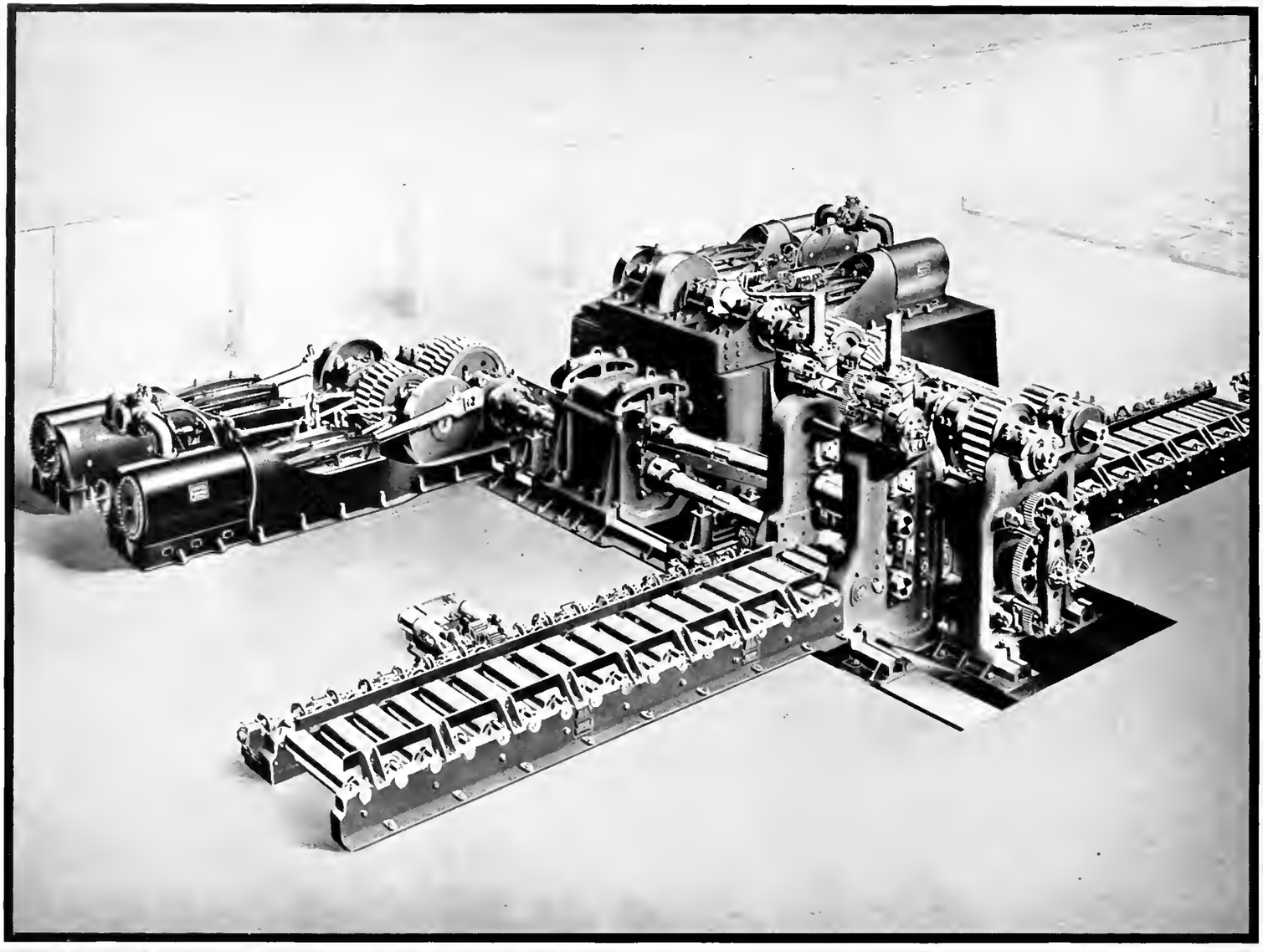
44" Mesta Blooming Mill and Equipment Installed at the Pennsylvania Works of The Bethlehem Steel Company

bearings and gearing, as well as motors for operating the manipulator, are located outside of the tables, leaving the space directly under the tables free and unobstructed for the removal of scale. Mesta Manipulators are exceptionally rapid in their action.

The side guards for either table are operated by common pinion shafts extending from one table to the other, thus insuring the corresponding side guards to always be in line. These pinion shafts are driven through slip gears for protection of the motors and drive.

Mesta Blooming Mills of the latest design can be seen in operation in many of the largest and most important steel plants in the United States.

The standard pinion diameters of Mesta Blooming Mills are 28 inches, 34 inches, 40 inches, and 45 inches. The capacities of these mills in tons produced per hour will be sent upon application.

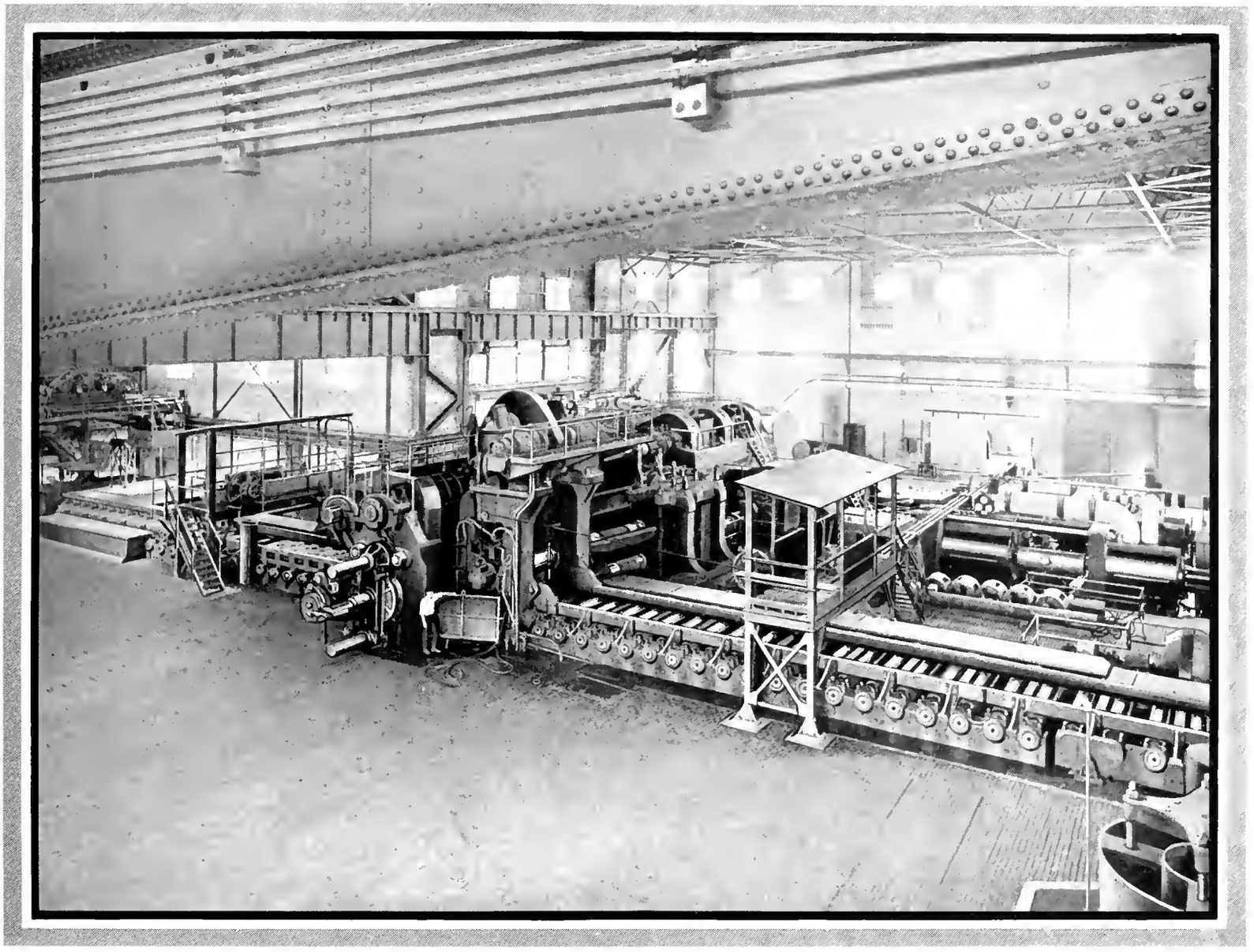


32″ Mesta Slabbing Mill and Reversing Engines Installed at the National Works of The National Tube Company

SLABBING MILLS

IN many respects, the slabbing mill is similar to a blooming mill and many of the features described under the heading of blooming mills also apply to slabbing mills.

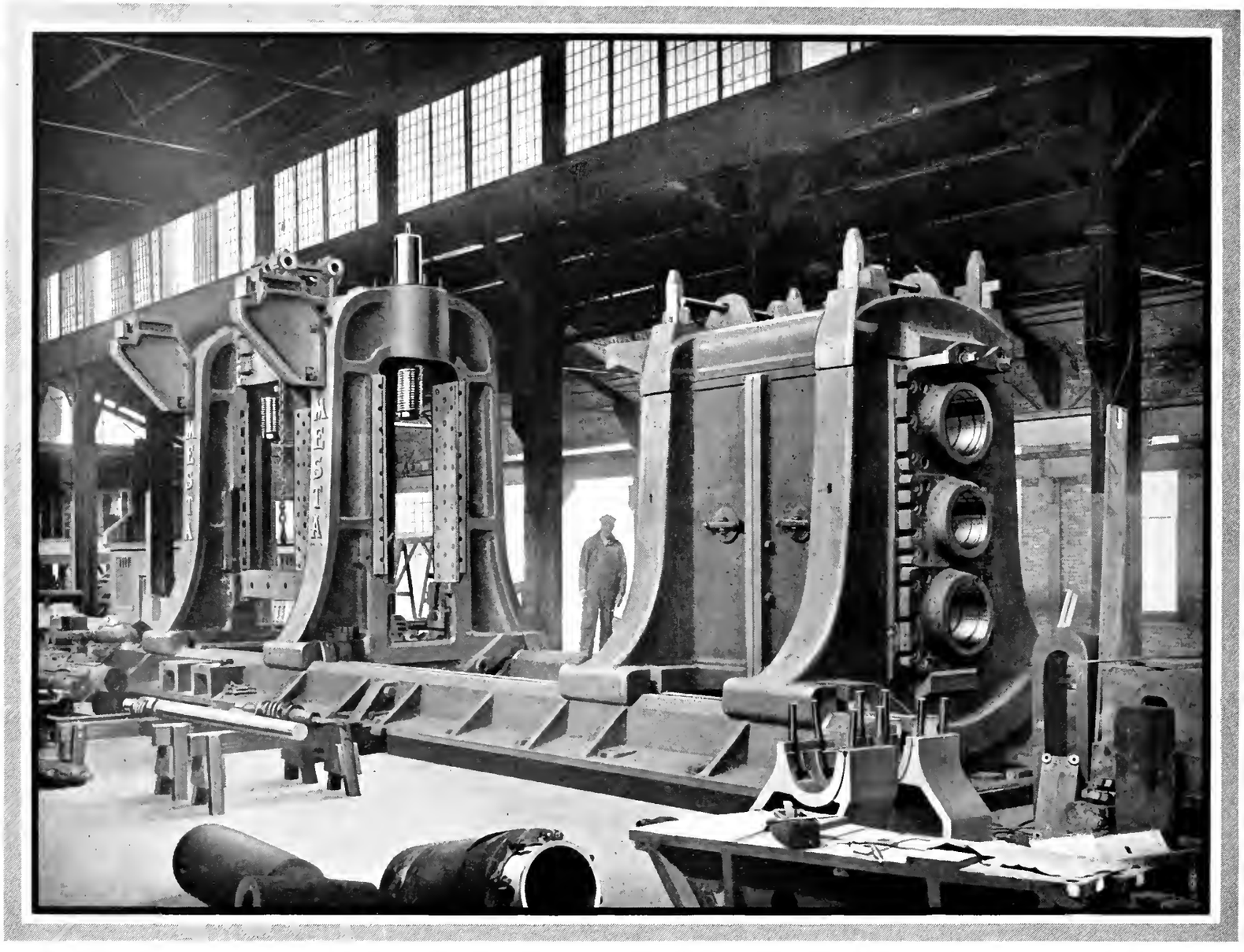
There is, however, one distinctive feature which distinguishes the Mesta Slabbing Mill not only from the blooming mill but also from all other slabbing mills and that is a patented arrangement whereby the two vertical rolls can be brought to within 14 inches of each other and at the same time be driven by mitre gears 52 inches in diameter, without the necessity of employing a third or idle roll. To accomplish this the Mesta Machine Company makes the shaft, which carries the vertical mitre gears, in two pieces instead of one, as in the old type of mill, and places one mitre shaft a sufficient distance above the other to allow the two horizontal mitre gears to overlap.



46″ Mesta Slabbing Mill, Reversing Engines and Complete Equipment Installed at the Gary Works of The Illinois Steel Company

There are several advantages in this arrangement; first, dispensing with the third or idle roll, which is a necessary element in other mills of this type in order to get the minimum distance between the vertical rolls; second, having two short mitre shafts with a bearing at each end, making the mechanism much more rigid; third, one mitre shaft, with gears and roll, can be taken out without interfering with the other.

The illustration on opposite page shows a Mesta Universal Mill with engines and mill tables, all of which were built and assembled in this Company's shops. It is obviously a great advantage to have a mill of this kind, together with the mill drive, built and assembled in one shop. The harmony in design and close fitting could not otherwise be obtained. This Company has ample capacity and equipment to build any size mill with all accessories.

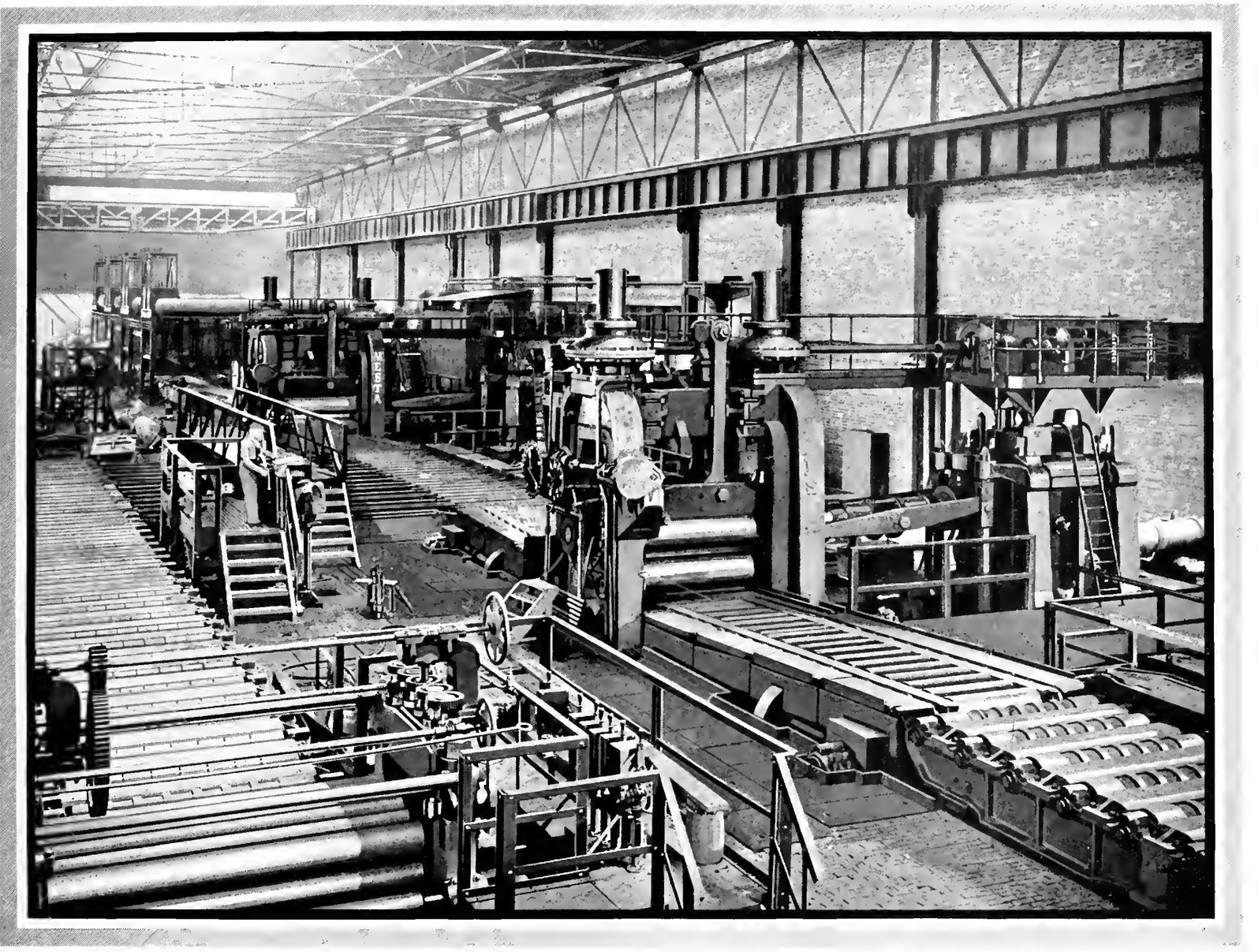


Three-High Plate Mill and Pinion Housing on Erecting Floor

PLATE MILLS

THE majority of the plate mills built by the Mesta Machine Company are of the three-high type, as this is the usual type installed. Two-high plate mills and universal plate mills comprising the most modern improvements are, however, a regular product of this Company.

Mesta Plate Mills are principally of the single stand type or of the tandem type. Although most plate mills are of the former type, the tandem mill offers many advantages, particularly that of increased output with lower cost of production. The illustration on page 79 shows such an arrangement and will, no doubt, become a favorite type for plate mill installations. It is much superior to the European type, in which the two mills are on a common shaft or "In Train," and driven by one engine or motor, as the jerky motion of the roughing rolls interferes with smooth operation of the finishing rolls and



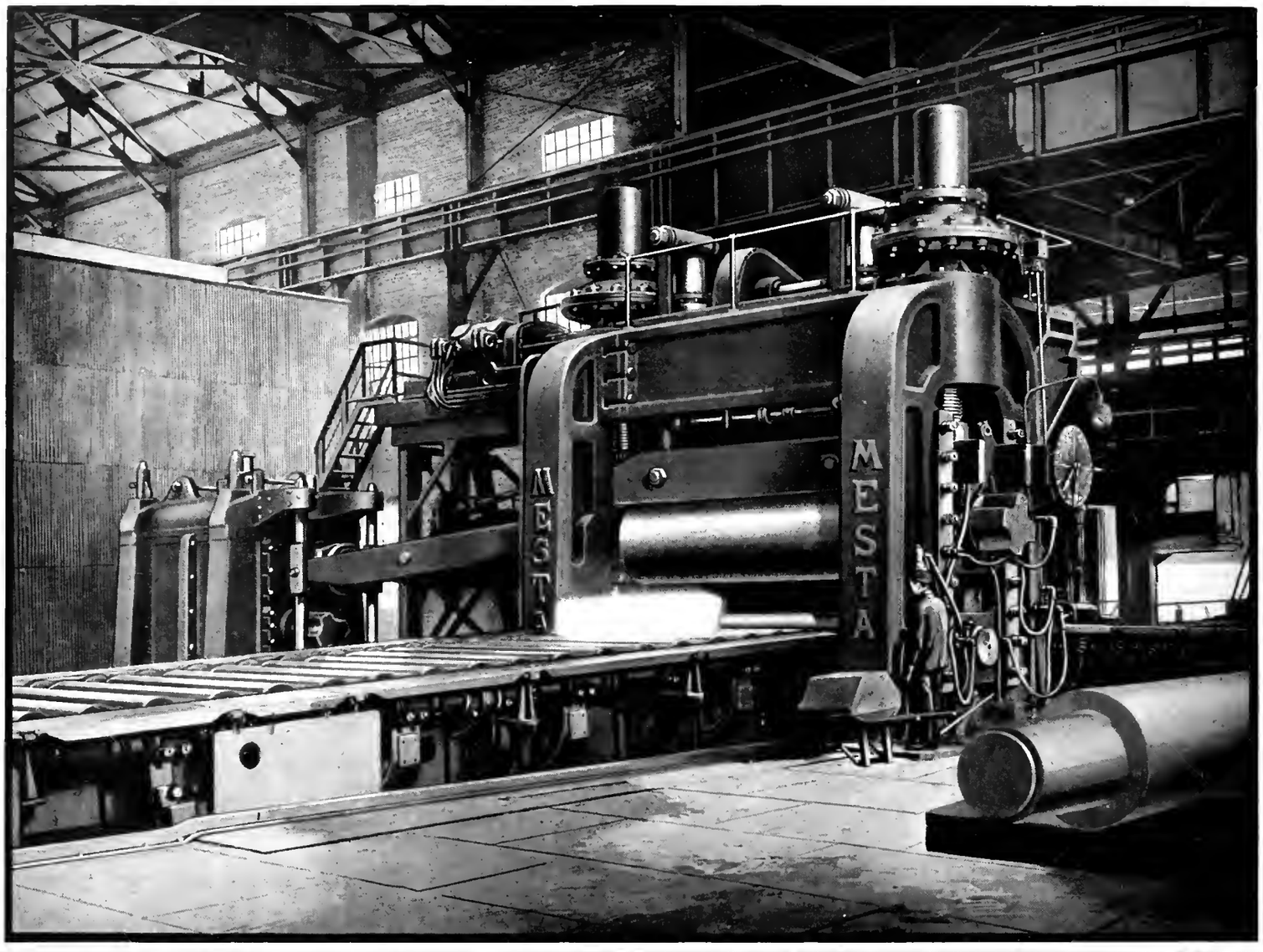
32″ x 84″ and 32″ x 96″ Mesta Tandem Plate Mill and Equipment Installed at the Plant of The Youngstown Sheet & Tube Company

therefore spoils the surface of the plates.

The Mesta Plate Mill has many points of superiority. In the balancing of the top roll the standard design consists of an overhead plunger operated by hydraulic pressure. The latter is kept constant by an accumulator which is so loaded as to give the desired minimum pressure on the necks of the upper roll. The middle roll is balanced by weights located in the scale pit.

The roll is moved up or down by causing an electric motor to add weight to a telescopic balance weight or to remove such weight. In this manner, the middle roll is moved with minimum effort, and is free at all times to follow the adjustment of the upper roll.

The proper finish of the plates leaving the mill cannot be obtained unless the rolls are extremely hard and uniformly hard. Mesta Plate Mill Rolls fill these specifications admirably. They are produced with the greatest care



44″ x 160″ Mesta Three-High Plate Mill and Equipment Installed at the Gary Works of The Illinois Steel Company

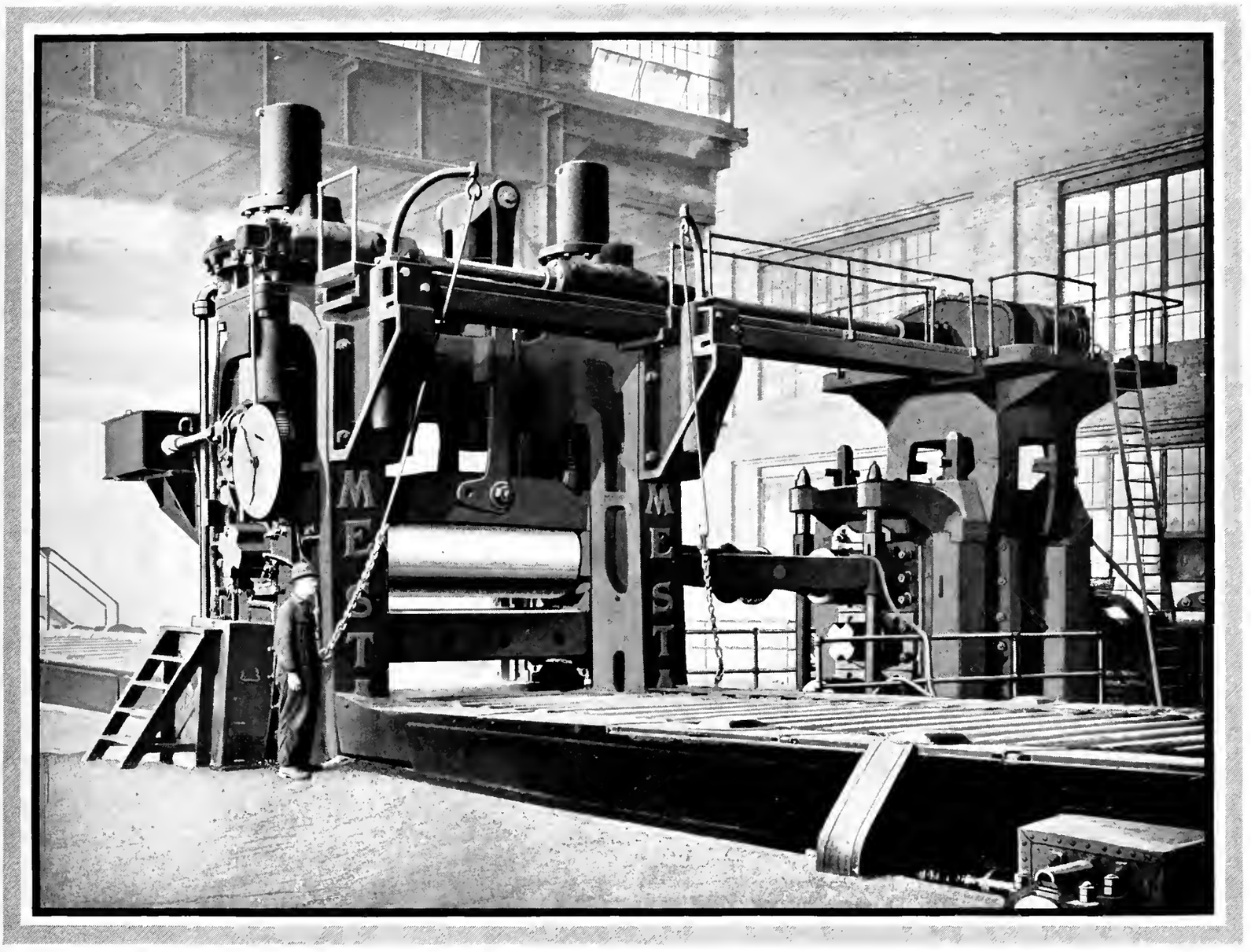
from chilled cast iron of a special mixture and have an excellent surface finish.

The rolls are provided with extra large necks. They are kept parallel at all times by an adjustment of one of the breaker blocks. This adjustment is effected by means of a screw which is operated from an electric motor through a vibrating shaft with universal joints.

Guides and strippers are provided for the proper passage of the plate through the rolls. For re-dressing the rolls in the mill a speed-reducing mechanism and tool rest is provided.

The screw-down is similar to that of the blooming mills described on page 72, except that worm gears are used instead of bevel gears. The electric motor for operating the screw-down is placed on top of the pinion housing away from the heat of the mill and salt fumes.

The mill pinions have double helical teeth and are cut on Mesta Patented



36″ x 110″ Mesta Three-High Plate Mill and Equipment Installed at the Sparrows Point Works of The Bethlehem Steel Company

Gear Planers. The pinions run in oil-tight housings and have extra long necks. The bearings of these necks are set up tight once for all. Practically no wear occurs, and no adjustments are necessary for the reason that the bearing pressure is low and the bearings are being oiled continuously.

The tables of Mesta Plate Mills are counterweighted and are crank operated, the driving power being derived from a slow-speed electric motor. The motor and the crank mechanism are set sufficiently far away to leave the floor unobstructed around the tables.

Both tables are operated from cranks set at 180 degrees on the same crank shaft. The tilting motion of the two tables is, therefore, identical, and the forces which they exert on the driving crank counteract each other whereby friction and the power to tilt the tables and the cost of operation are reduced to a minimum.

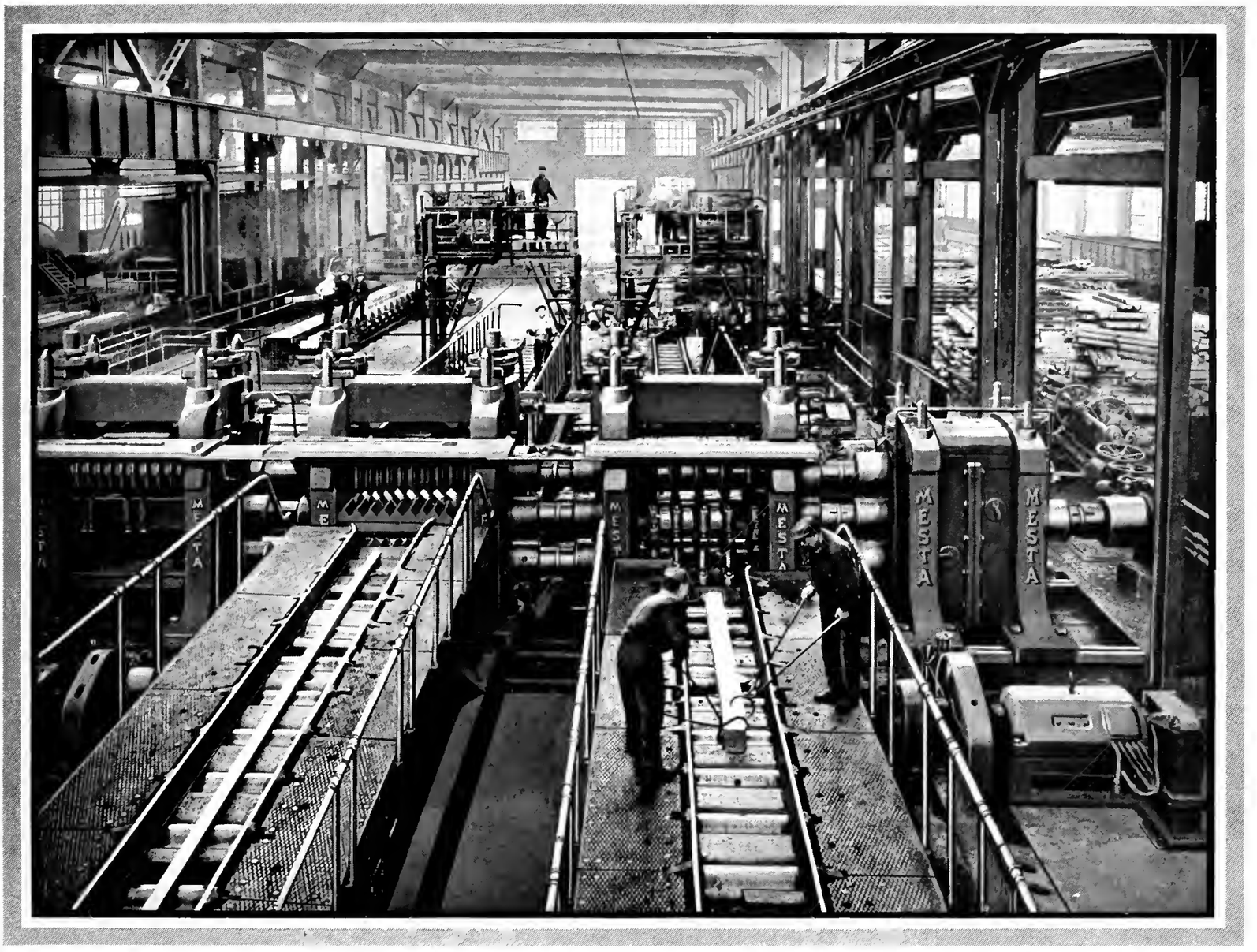
Bar Mill on Erecting Floor

MERCHANT, BAR AND STRUCTURAL MILLS

MERCHANT Mills, Bar Mills, Rail Mills, Billet Mills and Structural Mills form one large group, every one of these mills being, in fact, a bar mill. The Mesta Machine Company builds any of these mills, but prefers to build the larger sizes, because their works are particularly well equipped for large and heavy work. However, they build small mills in connection with larger ones, in furnishing the equipment for complete steel plants.

For mills of the sizes which are regularly built at the Mesta Works, namely from 16 inches up, traveling and tilting tables are recommended, because the tables reduce labor and increase tonnage. These tables vary with local conditions much more than the mills, which are more or less standard. The tables are well shown in the illustration on the opposite page.

In bar, rail and structural mills, the roll pass designer has ample

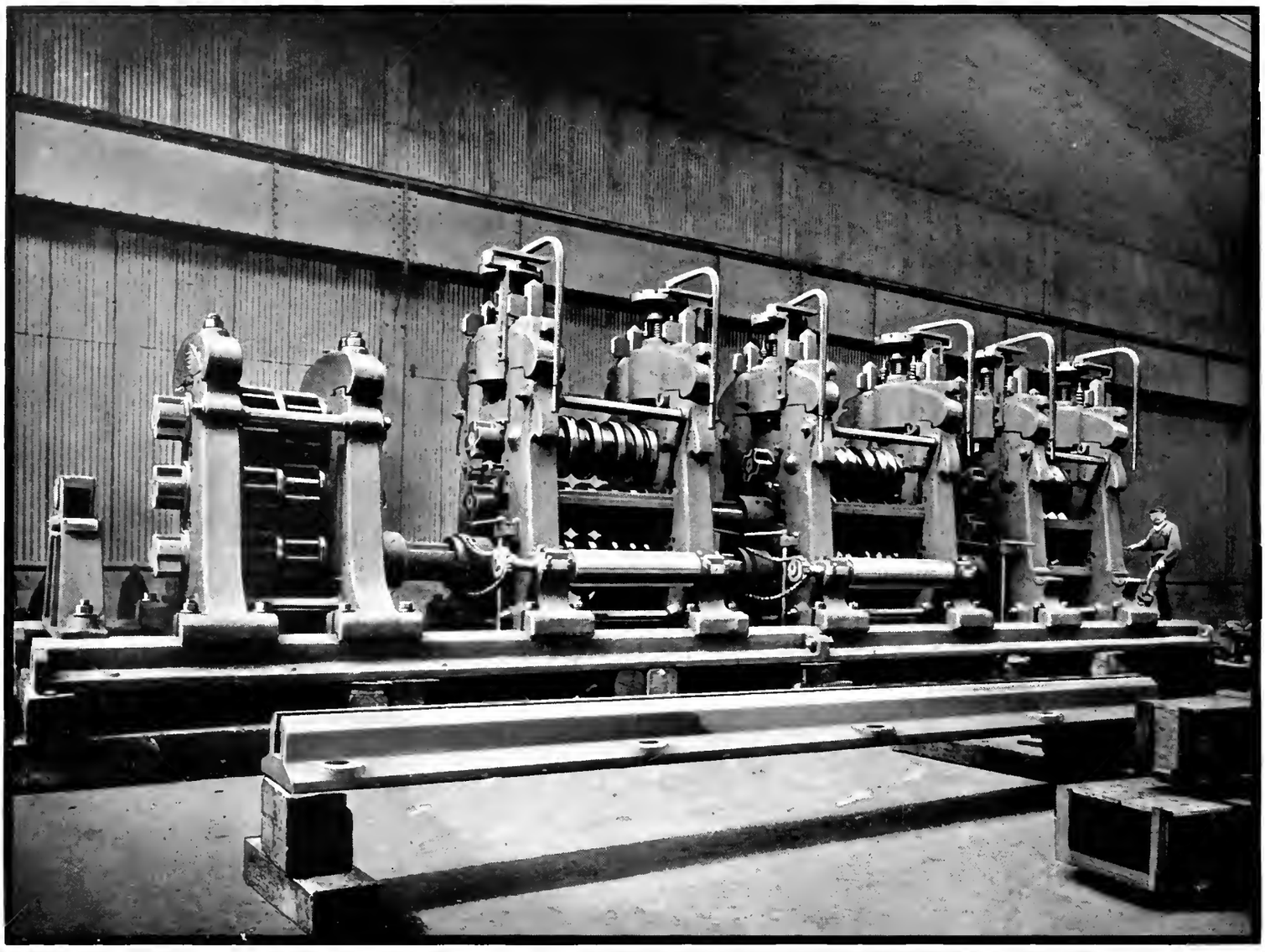


22″ Mesta Merchant Bar Mill Installed at the Plant of The Bethlehem Steel Company

opportunity to demonstrate his skill.

The Mesta Machine Company designs and makes rolls which will successfully roll any bar which it is practical to roll. For this purpose they have experienced roll pass designers, experienced metallurgists and experienced roll turners. In many cases these men have been called upon to install correctly grooved rolls in mills furnished by other builders.

In Mesta Bar Mills the middle roll is fixed, while the top and bottom rolls are adjusted by screws. The fixed position of the middle roll keeps the mill well in line with the driving engine or motor. The adjustment of the bottom and top rolls by screws results in a very rigid construction. The bottom screw and gear are well protected from scale. Those bar mills which are expected to have the rolls changed frequently have their housing caps held down by bolts with keys so that



22" Structural Mill on Erection Floor

they can be easily and quickly removed.

The rolls are axially adjustable by means of adjusting screws which pass through the housings and bear against the flanges of the bearing boxes.

When bar mills are to be driven by electric motors, it is desirable to have the motor running at a considerably higher speed than the rolls in order to reduce the cost of installation, both of electrical equipment and flywheel. To accomplish this, Mesta engineers have designed a very compact reduction pinion housing, which combines the gear drive with the pinion housing. Such an installation can be simplified by mounting the flywheel directly on the motor shaft, but if a separate flywheel set is desired, in order to adapt the mill to suit standard electrical equipment, the Mesta Machine Company is well prepared to design and build flywheel units most suitable for the purpose.

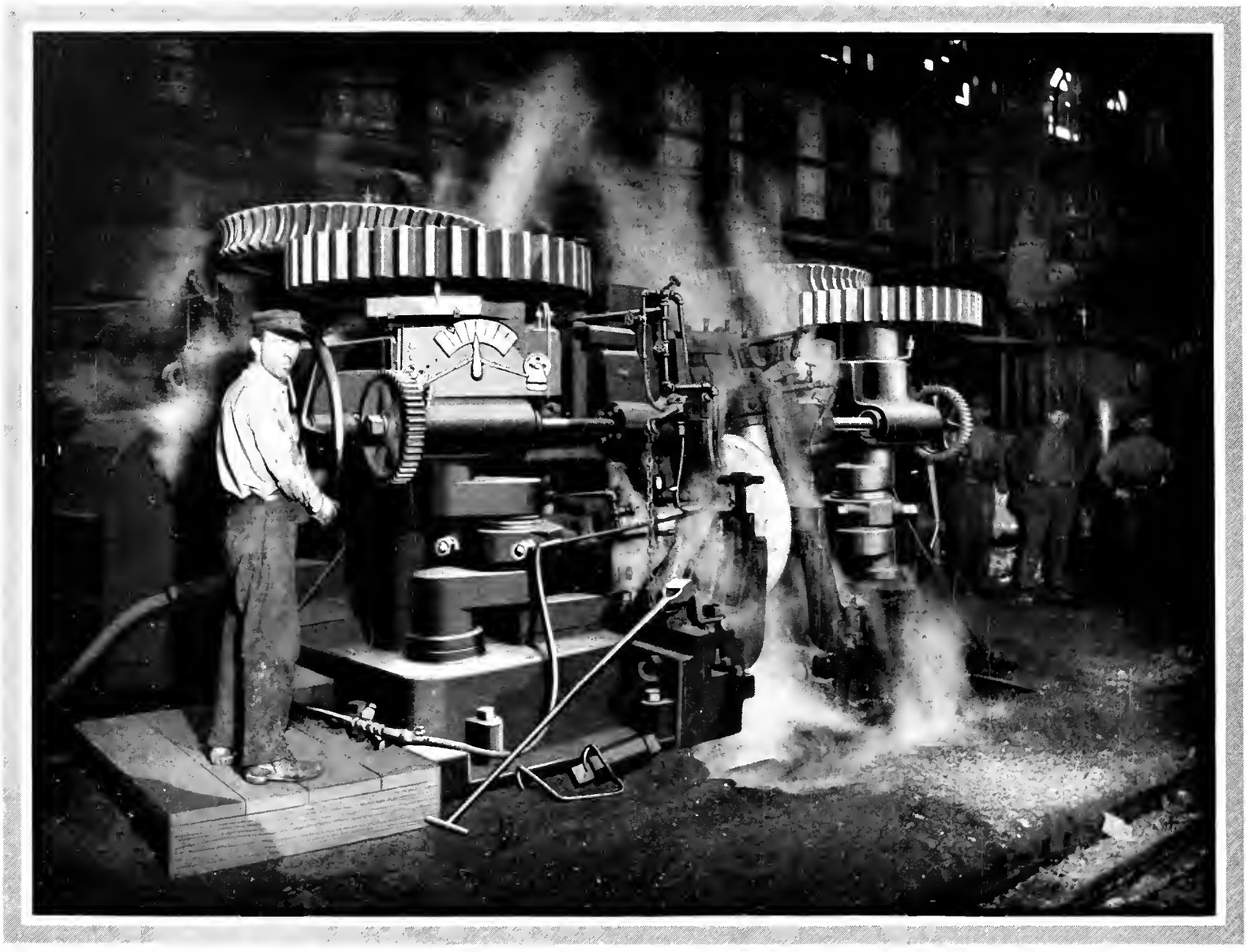
28" Mesta Structural Mill Installed at the South Works of The Illinois Steel Company

The housings are usually made with removable top, for the purpose of quick roll changes.

Practically all of the features mentioned in the description are shown in the illustration on the opposite page, which shows a Structural Mill on the erecting floor. However, the pinion housings are now built enclosed so that the pinions run in oil. The enclosed type of pinion housing is seen in the Bar Mill illustration on page 83.

Bar Mills require guides. Their proper or improper design has much to do with the success or the failure of the mill. Mesta engineers have frequently assisted rollers in the design of guides and boxes for mills of other makes.

The ratio of length of roll body to the diameter of the roll has been well standardized by the Mesta Machine Company for the different shapes which are rolled and for the different materials from which rolls are made.



42" Mesta Wheel Rolling Mill in Operation

WHEEL MILLS

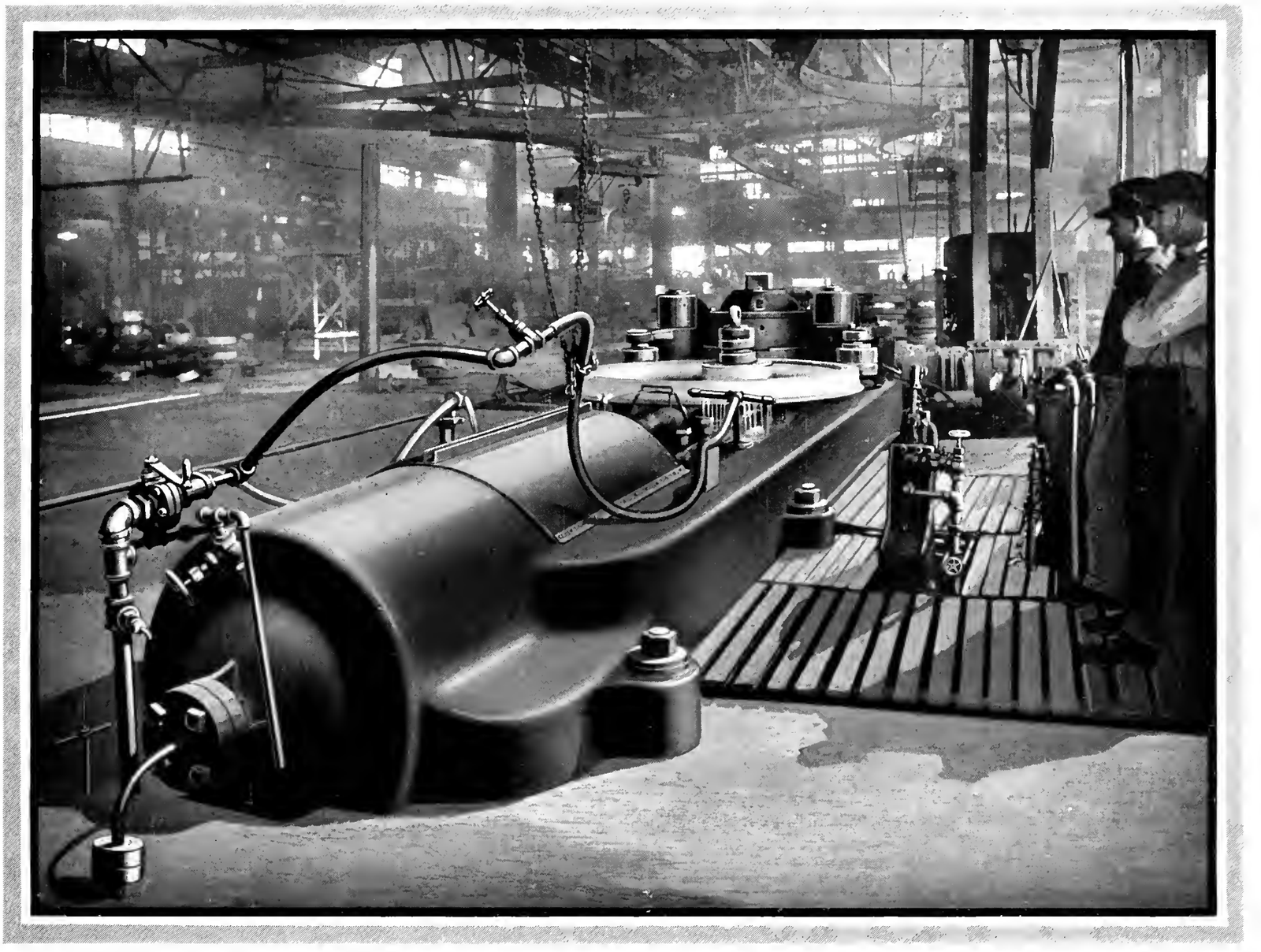
THE process of manufacturing a Rolled Steel Wheel requires a special class of machinery.

The steel blanks from which the wheels are made are first punched and given a preliminary form under large presses. They are then taken to the Wheel Mill, which rolls in the web, rim and tread.

From the Wheel Mill they are taken to a Dishing Press, which changes the web of the wheel from a straight to a curved section, which is done to eliminate any initial stresses.

The Mesta Machine Company builds these presses as well as the Wheel Mill and, with proper facilities for handling, the wheel can be completed by this equipment without reheating.

The Wheel Mill illustrated above and engines for driving same were designed and built by this Company, and with ample time allowed for handling has a capacity of 25 to 30 wheels per hour.



Mesta Tire Mill Capable of Rolling Tires Up to 10′ in Diameter

TIRE MILLS

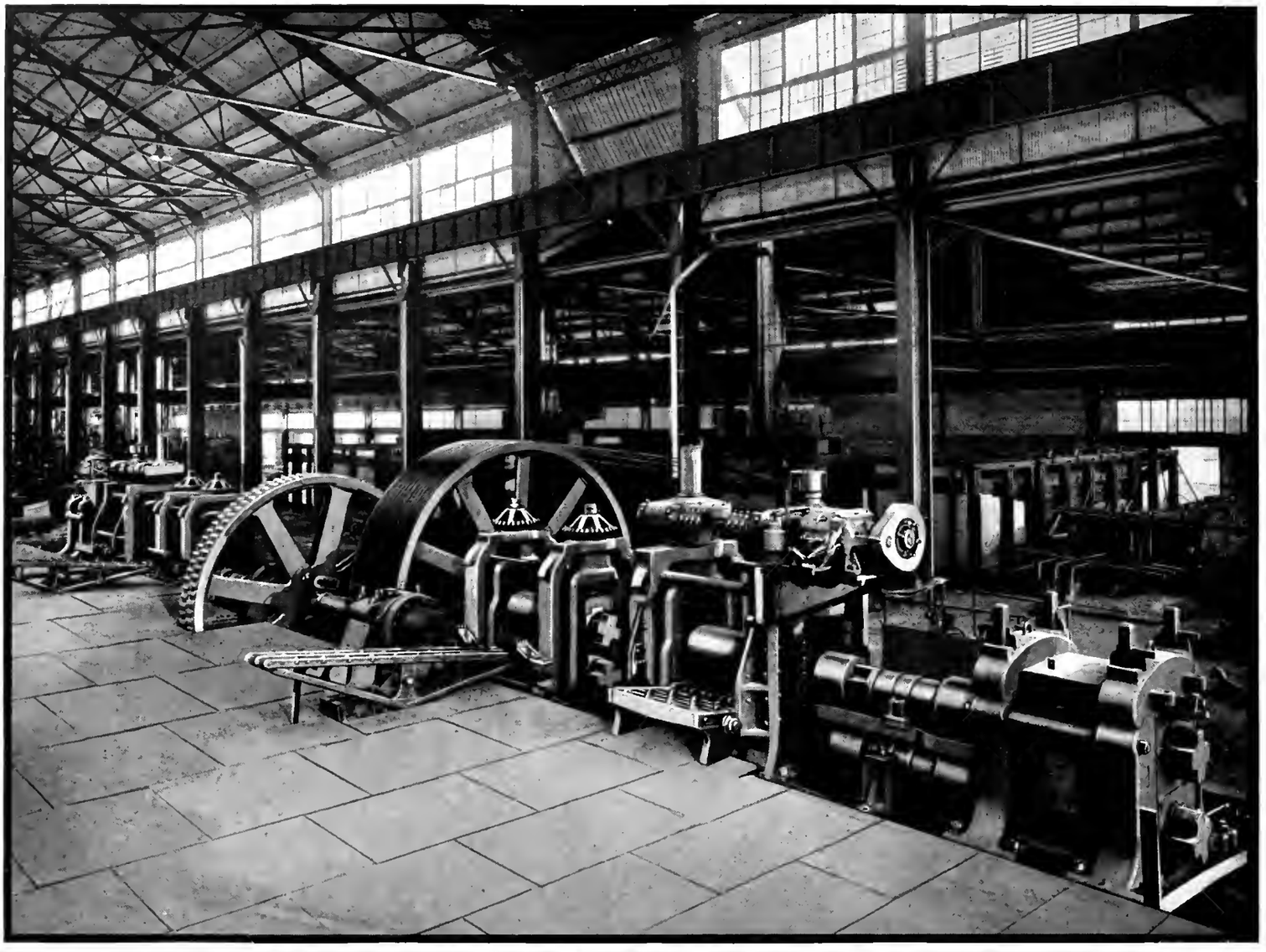
THE process of manufacturing a Rolled Steel Tire is very similar to that of a rolled steel wheel.

The blanks are first put under presses to punch out the center and give them a preliminary form. They are then conveyed to the Tire Mill and rolled to the proper diameter and shape.

The capacity of a Tire Mill, or the number of rolled tires it can produce in any given time, depends, of course, upon the size of the tire; but in any case the rolling operation is very rapid, and with proper facilities for handling, average sized tires can be produced at the rate of 15 to 20 per hour.

As in the case of a rolled steel wheel, a tire can be completed without reheating; the initial heat being sufficient.

The above illustration shows a Tire Mill built by the Mesta Machine Company for rolling locomotive tires, but on which can be rolled rings with rectangular and other sections.



Two 30" Mesta Jobbing Mills and Equipment with Combination Rope and Gear Drive Installed at the Plant of The American Rolling Mill Company

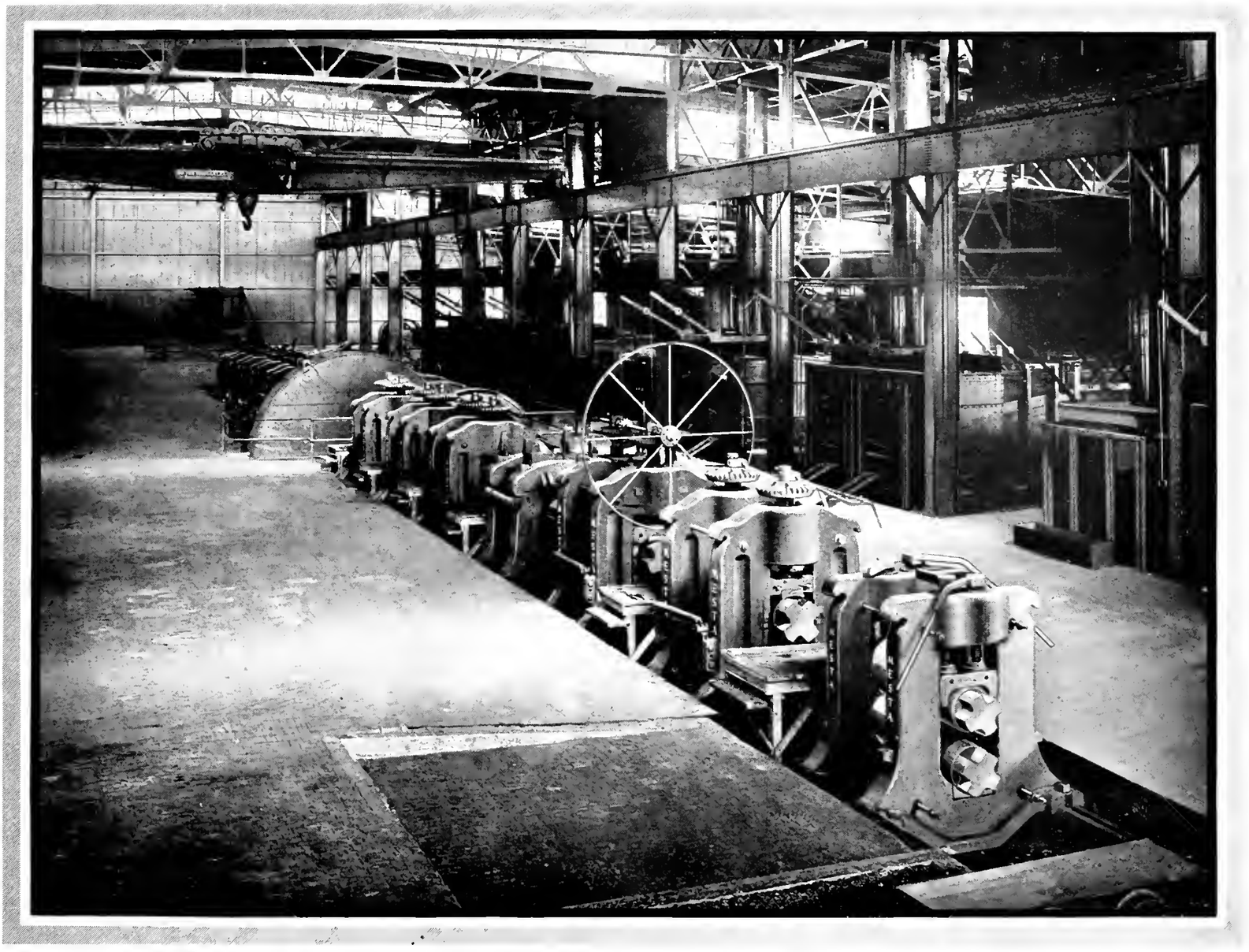
JOBBING MILLS

THE Jobbing Mill is virtually a Heavy Sheet Mill or Light Plate Mill and supplies that product which is too heavy to be rolled on a sheet mill or too light to be rolled on a plate mill.

The Mesta Jobbing Mill is designed and built to roll heavy sheets or light plates ranging from $\frac{1}{8}$ inch to $\frac{1}{2}$ inch in thickness.

In general, the mill is of the two-high type and consists of a stand of pinions, a stand of roughing rolls and a stand of finishing rolls arranged as shown in the above illustration.

The roughing stand has both rolls driven and motor-operated screws, while the finishing stand has the bottom roll only driven and hand-operated screws. Chilled rolls are used in the finishing stand, while the roughing stand is usually equipped with steel rolls or "Mesta Special" rolls, but the latter are to be preferred on account of their superior wearing qualities.



28″ Mesta Sheet Mill and 1200 H.P. Mesta Gear Drive Installed at The Empire Rolling Mill Company

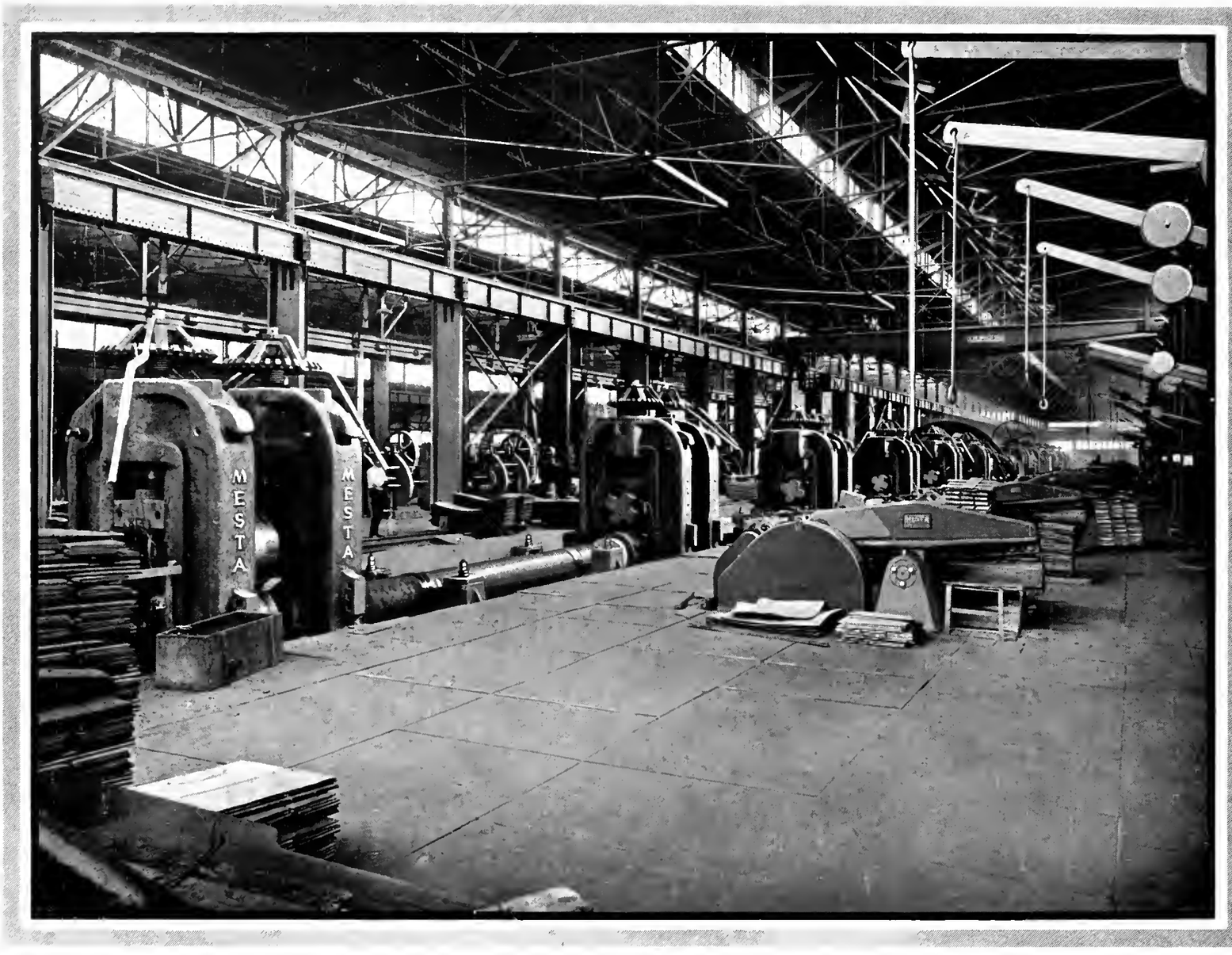
SHEET MILLS

As sheets must be rolled in one direction only, Sheet Mills are necessarily of the two-high type, as shown in the above illustration, and are adapted for rolling sheets up to about $\frac{1}{8}$-inch maximum.

While the construction of such mills has been standardized in a general way, the Mesta Sheet Mill has a number of qualifications that have attributed largely to its success.

As in the case of all machinery manufactured by this Company, special attention has been given to the construction and workmanship to insure rigidity, strength and proper fitting and alignment of parts which is particularly essential in mills rolling light gauge product.

Mesta chilled rolls, used in the finishing stands, are especially adapted for rolling high grade sheets and particularly where a highly finished surface is desired.



Mesta Tin Plate Mills, Shears, Pickling Machines and Equipment Installed at The Trumbull Steel Company

TIN PLATE MILLS

FOR thirty years the Mesta Machine Company has been engaged in the designing and building of tin mills and other machinery for the manufacture of tin plate and has the distinction of having designed and built the first tin mill plant that was installed in the United States for rolling tin plate.

The experience gained in the manufacture of tin plate machinery during this time has resulted in many improvements and refinements in construction, and today Mesta machinery can be seen in use in practically all of the tin mill plants in the United States.

Some of the larger tin plate plants in this country are completely equipped with Mesta tin mill machinery consisting of hot mills, cold mills, engines or motor drives, doubling shears, squaring shears, pickling machines, etc., and it is these plants that have established notable records for large output and low cost of production.

Mesta Cold Mills for Tin Plate Installed at The McKeesport Tin Plate Company

COLD MILLS

THE steel sheets for manufacturing tin plate, after coming from the hot rolls, are pickled and annealed and then transferred to the cold mills to be cold rolled. The object in cold rolling is to produce a very smooth surface finish.

Mesta Cold Mills equipped with their cold rolls of extra hard chill are well adapted for cold rolling, and can be seen in many of the principal tin plate plants in this country.

Cold Mills are either arranged in a single train in which the sheet is given three or four passes through the same stand, or with several mills in tandem as shown in the above illustration, in which case the sheet passes through each stand of rolls but once. With the latter arrangement the cost of cold rolling is considerably reduced, as a greater tonnage can be rolled with a less cost per ton than with the single-stand arrangement.

Mesta Pickling Machine Pickling Stamped Metal Parts

PICKLING MACHINES

THE Mesta Patented Pickling Machine was first introduced for removing oxide or scale from iron and steel sheets used for making tin plate, and is now used in practically all sheet and tin plate plants in the United States and Canada, as well as in many foreign countries.

After proving to be such a success in pickling iron and steel sheets, it was rapidly introduced in many other lines of manufacture, and is now used in many plants for pickling miscellaneous products, such as wire coils, strip steel, pipe, stamped metal parts and hollow ware, cartridge cases, gun parts, automobile parts, small castings, drop forgings and various other products of iron, steel, brass and copper.

The machine is simple in construction, consisting of a vertical cylinder with operating valve, piston and plunger which carries a number of horizontal arms from which are suspended acid-proof crates containing the material to be pickled.

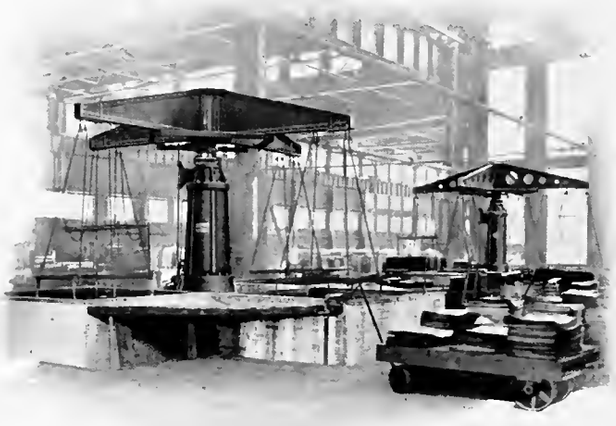
The piston is of the floating type as the plunger is guided both top and bottom. A projection from the bottom of the base plate extends into the foundation to provide clearance space for the bottom of the plunger and at the same time to insure stability of the machine.

The machine can be operated by steam or compressed air at a pressure of 80 pounds per square inch. When operated by steam, the exhaust steam is used for heating the acid in the pickling vats.

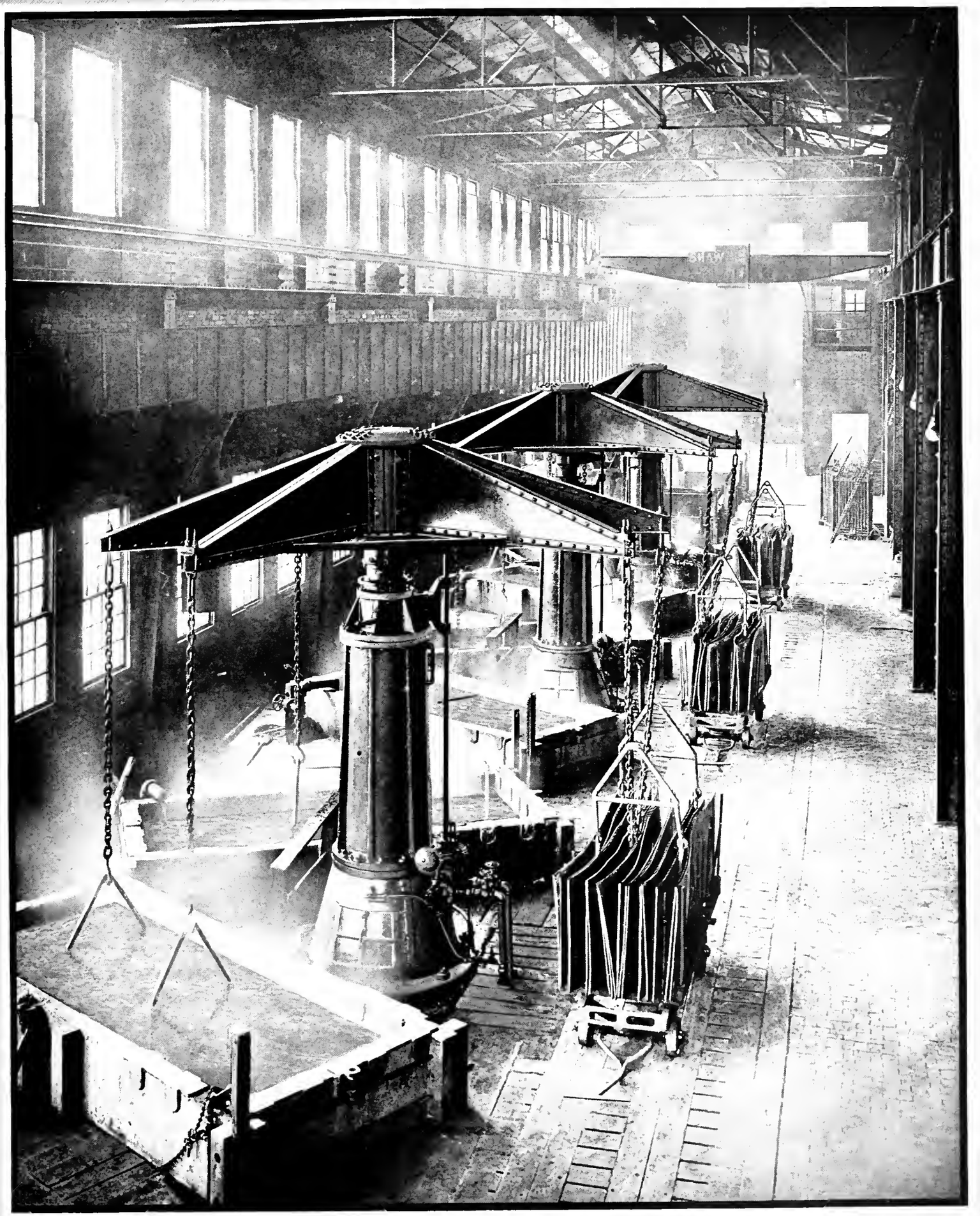
No skilled mechanics are necessary, as the machine is entirely automatic in its operation, giving the crates a vertical motion in the acid at a rate of about thirty strokes per minute while the material is being pickled.

No crane service is necessary, as the machine acts as a crane for lifting the crates in and out of the vats.

The material, being constantly in motion while in the acid solution and water, is thoroughly and uniformly cleaned in much less time and at a much less cost of acid and labor than by any other process of pickling.



Mesta Pickling Machines Pickling Steel Sheets for Tin Plate



Mesta Pickling Machines Pickling Long Sheets

One of the Two 1200 H.P. Mesta Double Helical Cut Tooth Gear Drives Installed at the Plant of The Standard Tin Plate Company

GEAR DRIVES

THE very heavy and rugged construction, the quiet running and the durability of the gears, as furnished by the Mesta Machine Company, have placed Mesta Gear Drives in a leading position on the American market.

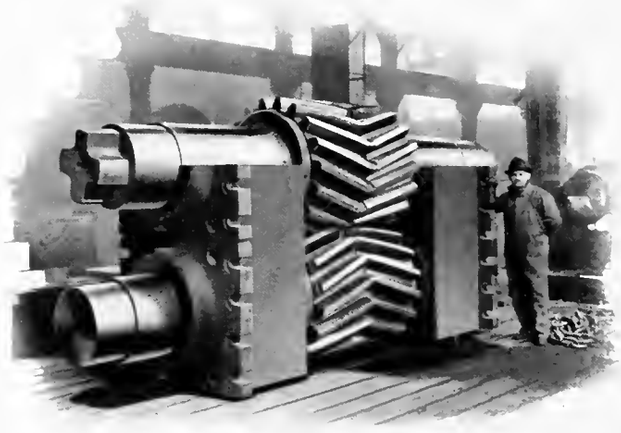
These gear drives are made in sizes capable of transmitting any desired amount of power and with reductions as high as twelve to one in a single set of gears. Gear drives with double helical cut teeth have proved to be the most economical method for transmitting power from a high-speed driver to a mill operating at low speed. Motor-driven sheet and plate mills are examples of this class of machinery.

Mesta Gear Drives have double helical cut gears which are cut on the Mesta Patented Gear Planers, described on page 37. These gears, running in an oil-tight housing, have been in successful operation in the principal steel plants in the United States for years.

One of Two 1200 H.P. Mesta Double Helical Cut Tooth Gear Drives for Driving Tin Plate Mills Installed at the Sparrows Point Works of The Bethlehem Steel Company

The gear frame, carrying the bearings of these drives, is usually made in one piece. The slow-speed bearings have removable bottom shells and caps lined with babbitt metal and are oiled by means of rings. The driving or high-speed shaft has self-aligning bearings which are babbitt lined and ring oiled. Flywheels are carried on the driving or pinion shaft, one at each side of the frame. This construction equalizes the pressure on both bearings, causing uniform wear of the latter and maintaining in this way a perfect tooth contact of the gears. Heavy gear covers, made either of steel plate or of cast iron, are provided and enclose the gears entirely, excluding dirt and dust and retaining oil which is introduced between the gears near the place of contact.

Mesta Gear Drives are especially adapted for rolling mill service or for any other heavy work where gears of coarse pitch are necessary.



Double Helical Cut Tooth Mill Pinions

DOUBLE HELICAL CUT TOOTH MILL PINIONS

ROLLING Mill Pinions, especially those used in the larger types of rolling mills, such as reversing blooming mills and slabbing mills, roughing mills and plate mills, work under more severe conditions than any other type of toothed gearing. Teeth with coarse pitch are, therefore, essential for such pinions to withstand the severe strains encountered and from actual experience it has been demonstrated that the cut double helical type of tooth is the best adapted for such conditions.

The Mesta Machine Company is particularly well equipped to manufacture rolling mill pinions of this type, as their Patented Double Helical Gear Planers, heretofore described, produce an extremely accurate tooth with full bearing across the entire face and free from backlash.

This Company is prepared to furnish double helical cut tooth mill pinions, either of a casting or forging and of acid open hearth steel or alloy steel to suit any condition of rolling mill service.

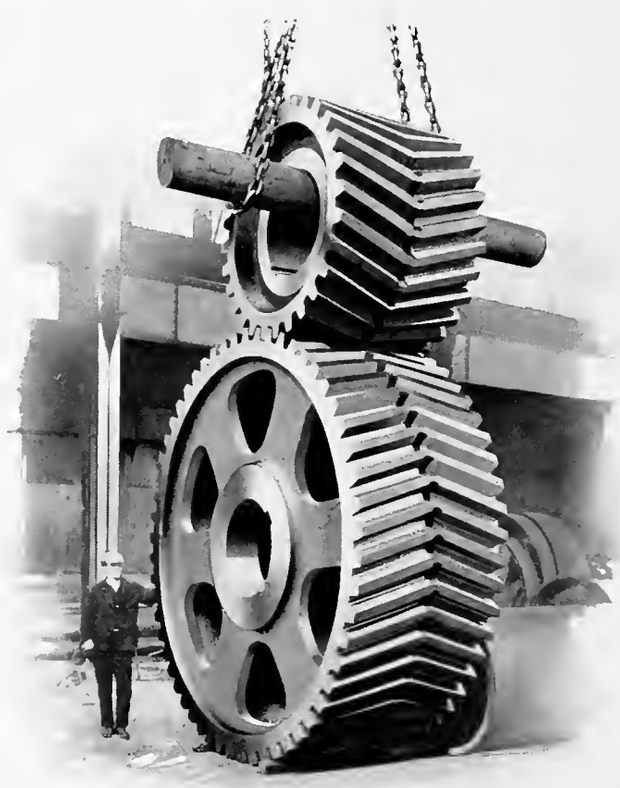
DOUBLE HELICAL CUT TOOTH GEARS

THE Double Helical Cut Gears, manufactured by the Mesta Machine Company, are especially adapted for heavy motor drives and geared engines.

The teeth in gears, cut by the above-mentioned method, can be made of sufficiently large pitch to furnish that factor of safety which is so essential in rolling mill service.

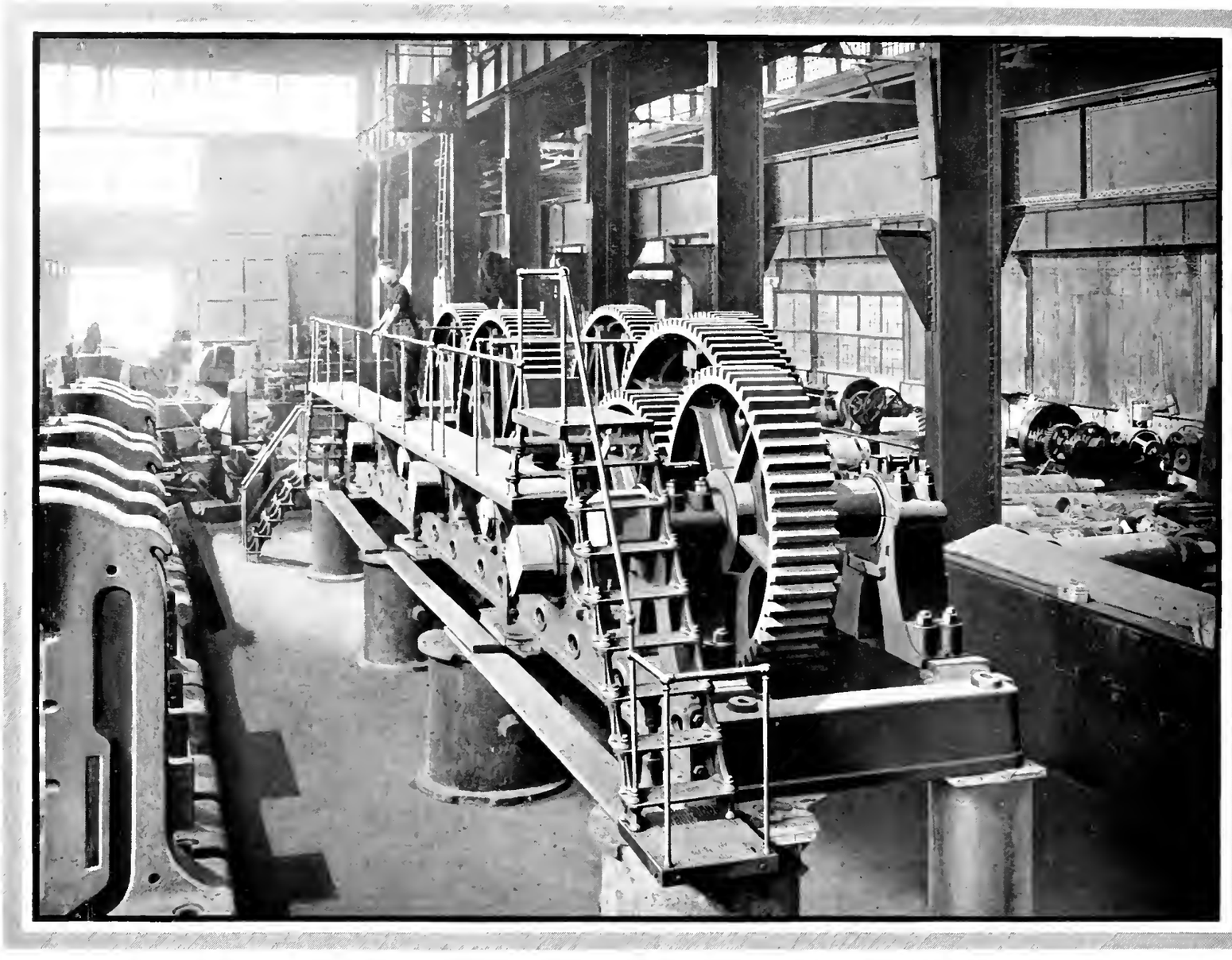
Furthermore, a coarse pitch permits the use of a comparatively narrow face, which in turn avoids local concentration of tooth pressure and the danger of tooth breakage resulting therefrom.

The Mesta Machine Company manufactures Cut Double Helical Gears up to 30 feet in diameter, 6 feet in face, and with any pitch of tooth necessary.



Double Helical Cut Tooth Gears for Geared Reversing Engine

Double Helical Cut Tooth Gear Wheel for 1800 H.P. Gear Drive on Erecting Floor

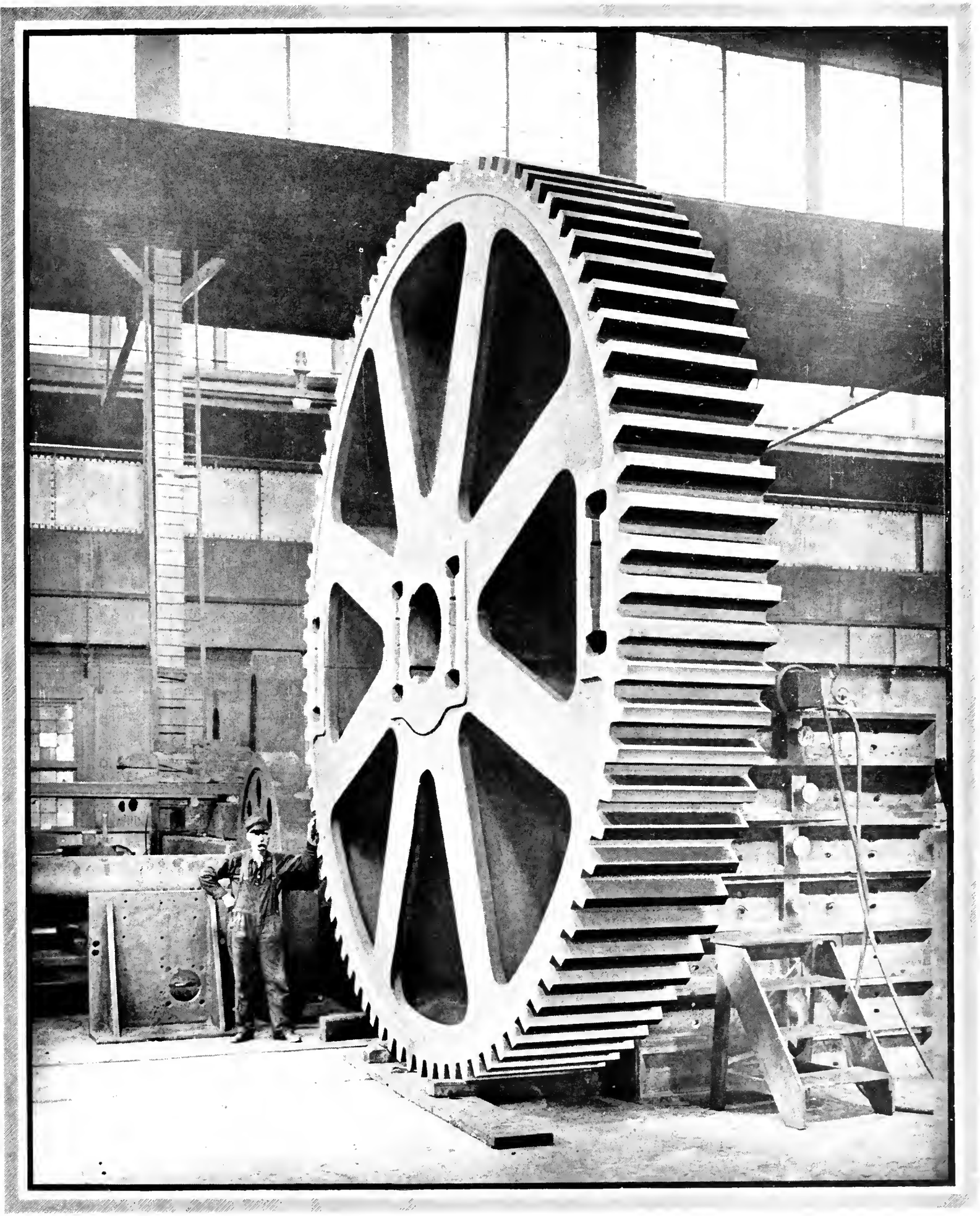


Sugar Mill Drive with Gears Having Straight Cut Teeth

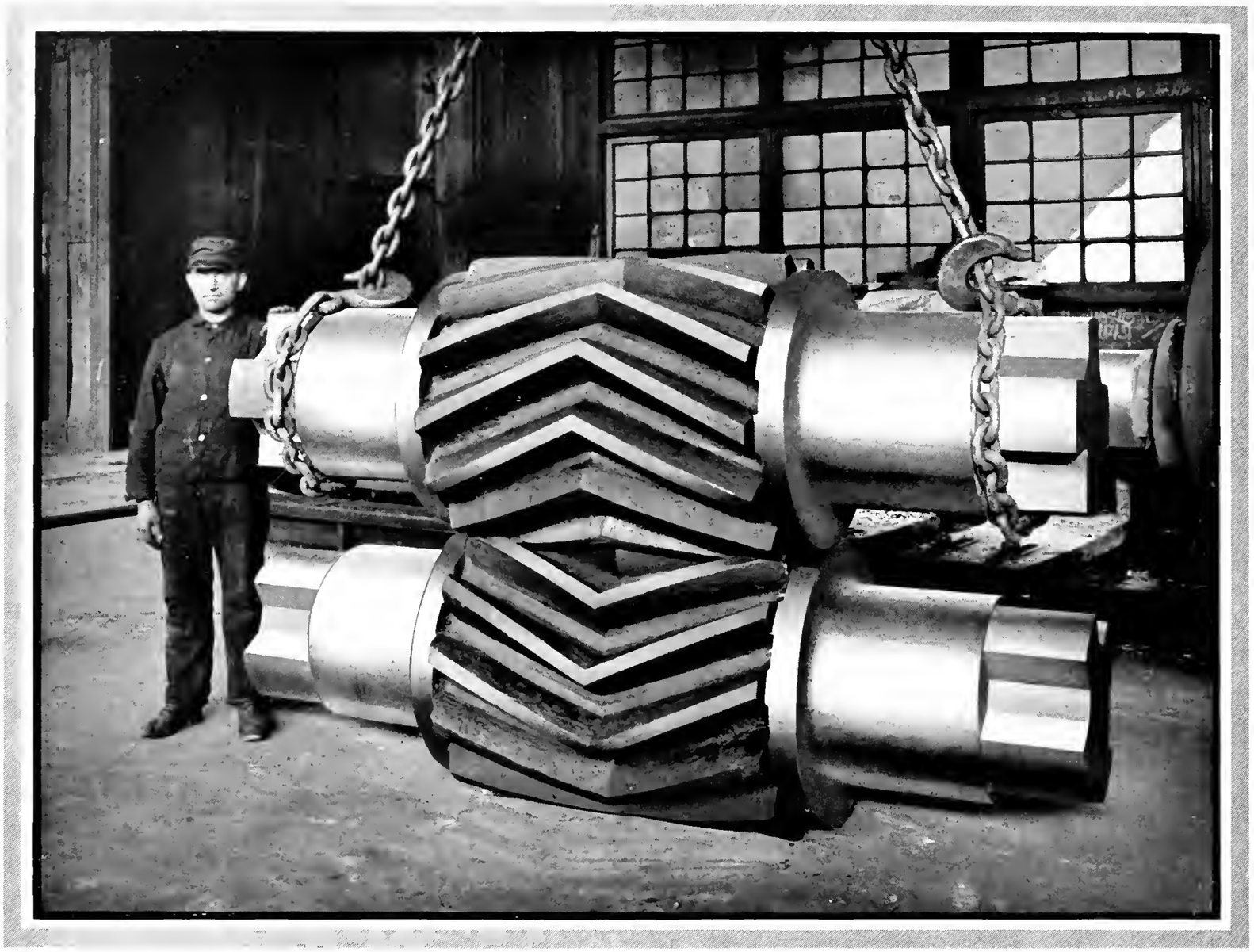
STRAIGHT CUT TOOTH GEARS

WHILE, under certain conditions, the Cut Double Helical Gear is to be preferred and has replaced the Cut Straight Tooth Spur Gear to some extent, nevertheless there is still a broad field for the latter class of gears in drives and other machinery where the peripheral speed does not exceed 1600 feet per minute and where the gear ratios are not extremely great. Gear drives for certain types of rolling mills, sugar mills and many other classes of miscellaneous machinery, present ideal conditions for the Cut Straight Tooth Spur Gears and in such cases this type of gear is preferred on account of being less expensive than the double helical type and at the same time rendering satisfactory service.

This Company is prepared to furnish Cut Straight Tooth Spur Gears up to 32 feet in diameter and 6 feet in face, of air furnace melted cast iron, acid open hearth steel or alloy steel.



Large Straight Cut Tooth Gear for Rolling Mill Service

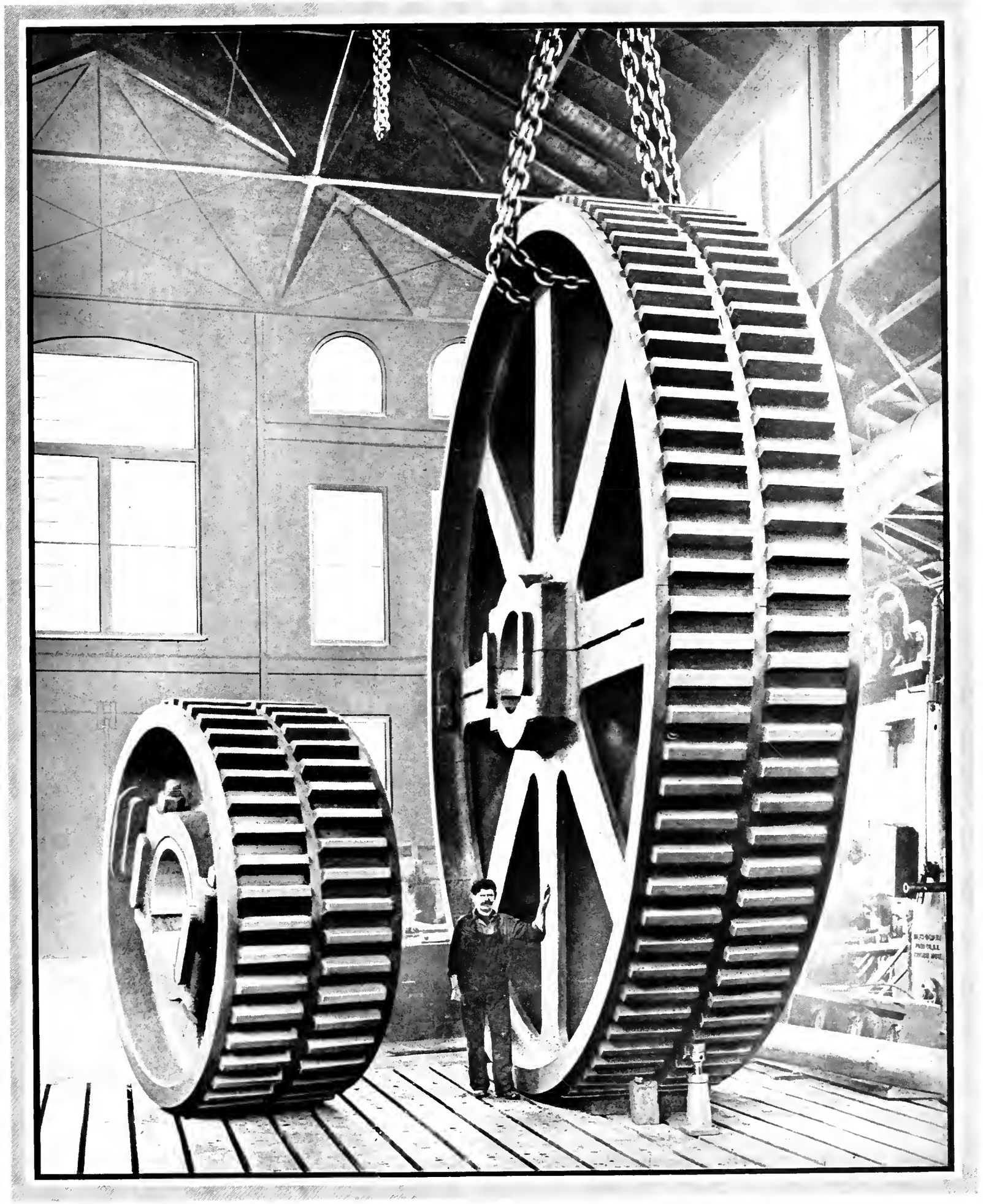


Machine Molded Double Helical Tooth Mill Pinions

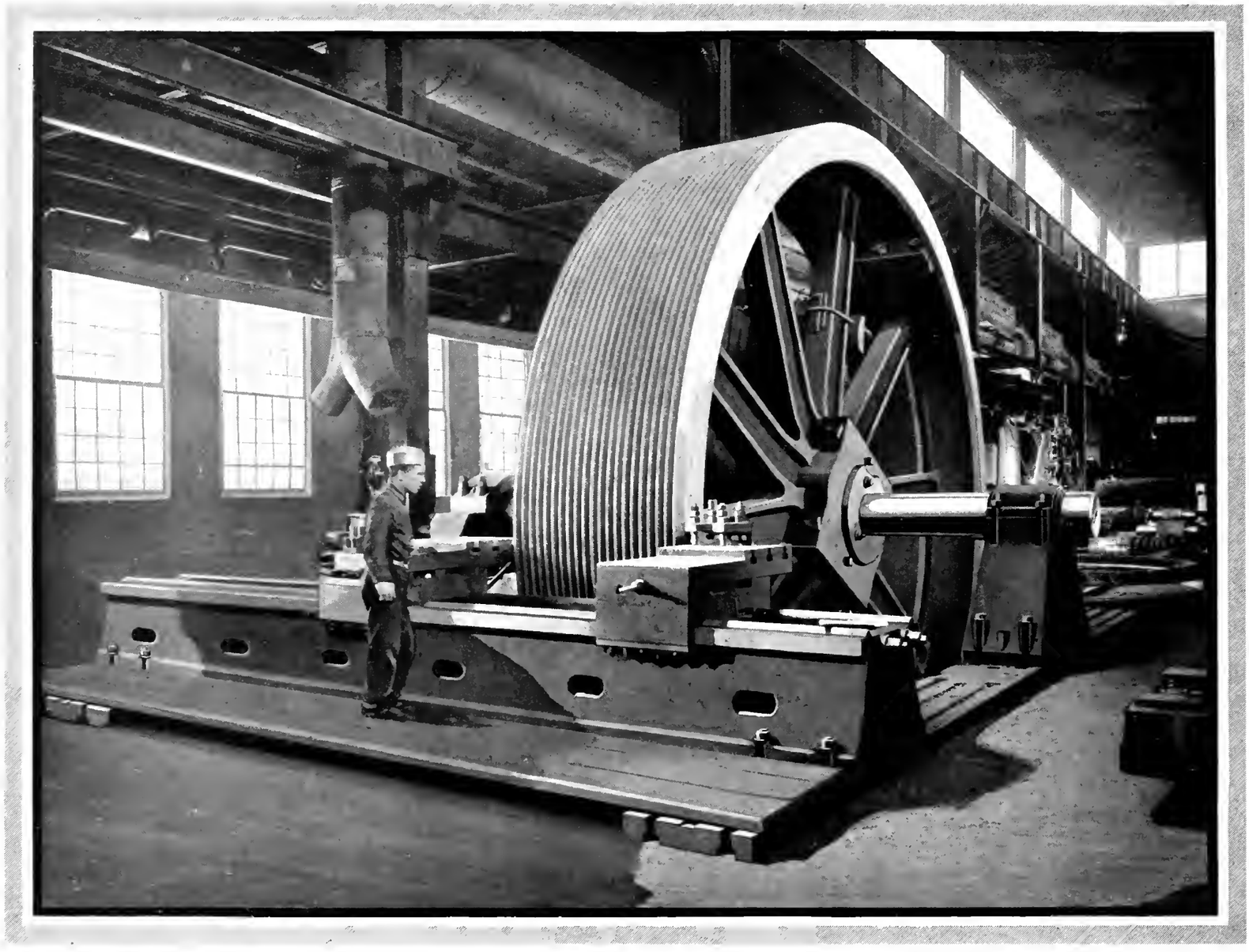
MACHINE MOLDED ROLLING MILL PINIONS

THE Mesta Machine Company is prepared to furnish machine molded rolling mill pinions of acid open hearth or alloy steel and from the smallest to the largest that may be required.

While the degree of accuracy of a cast tooth is not equal to that of a machined tooth, yet it can be stated that due to the accuracy of the machine molding process employed, Mesta Mill Pinions are far superior to pinions molded from patterns or by any other method. By this process of molding, the clearance or backlash between the engaging teeth can be reduced to a minimum and is in any case not more than one-half the clearance usually found in pattern molded pinions. This is a decided advantage, especially in the case of reversing mills; the reduced clearance considerably lessening the shock on the teeth when the pinions are reversing and insuring quiet operation and long service.



Machine Molded Staggered Tooth Gears



Turning Rope Wheel in Pit Lathe

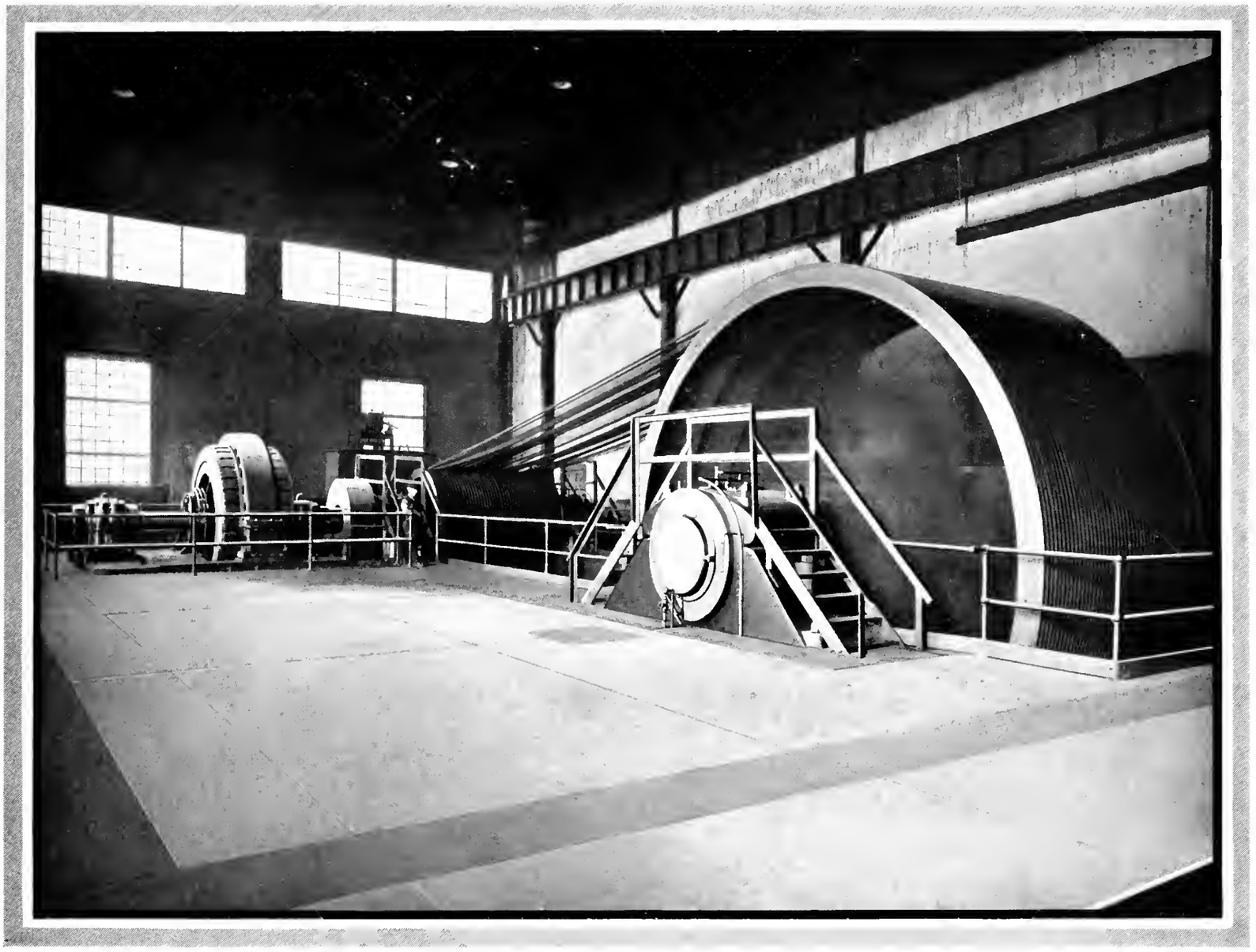
ROPE DRIVES

HEAVY Rope Drives have been designed and built by the Mesta Machine Company for practically all types of direct running mills.

The pillow blocks or bearings are of heavy duty design with ample bearing surfaces and adjustment provided for taking up the wear and preserving alignment. The rope wheels are made of a special grade of air furnace melted iron of high tensile strength; the grooves being accurately machined in a pit lathe as shown in the above illustration.

The rope drive is high in efficiency, comparatively low in cost of installation, noiseless in operation and furnishes a smooth, continuous transmission of power. The motor or engine can be located away from the grit and heat, which is sometimes done by placing the drive in an adjoining building.

Another distinct advantage lies in the fact that any shocks, caused by the machinery being driven, are not trans-



Mesta Rope Drive Installed at The Inland Steel Company

mitted to the motor or engine on account of the elasticity of the ropes.

Mesta Rope Drives are built on the multiple or parallel system, sometimes called the English system, in which each rope is a separate unit.

The construction of the wheel and the material used in its manufacture are such that comparatively high speeds can be maintained with absolute safety. No vibration occurs even with the highest speeds, due to the wheels being accurately finished and in perfect balance.

Any rope-driven mill or other machinery does not require a separate flywheel for storing energy, as the rope wheel is designed with the proper weight of rim to give the necessary flywheel effect.

Rope drives can be used to advantage in cases where several mills or other sets of machinery, located at different centers, are to be driven by the same engine or motor.

High Speed Flywheel
Cast Steel Rim with Sides of Steel Plate

FLYWHEELS

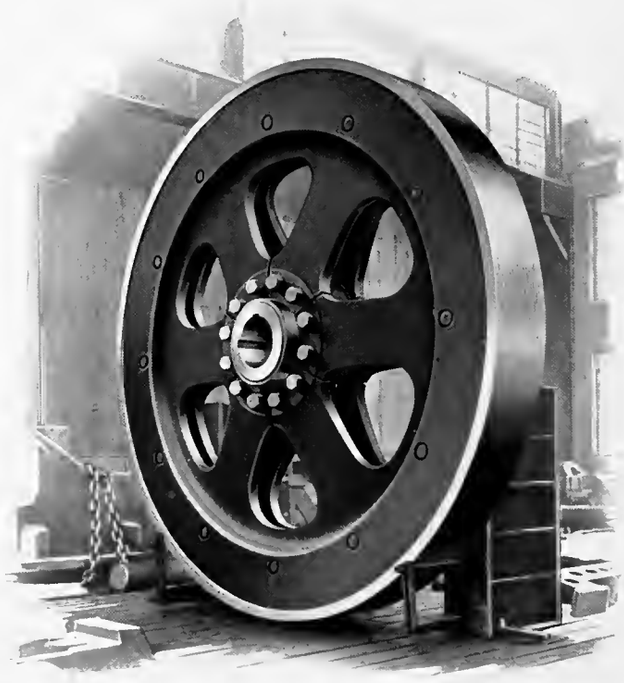
FLYWHEELS are built by the Mesta Machine Company for use in connection with engines, mills, motor drives and other machinery to suit any conditions required.

High speed flywheels for motor drives are either built up entirely of plates, made with a cast steel rim and plate sides as shown in above illustration, or with cast steel solid rim with the arms split apart at the center and a separate cast steel hub, as shown in the opposite illustration, or of built-up construction with the rim and arms made in segments bolted to a separate hub as shown in the illustration on the opposite page.

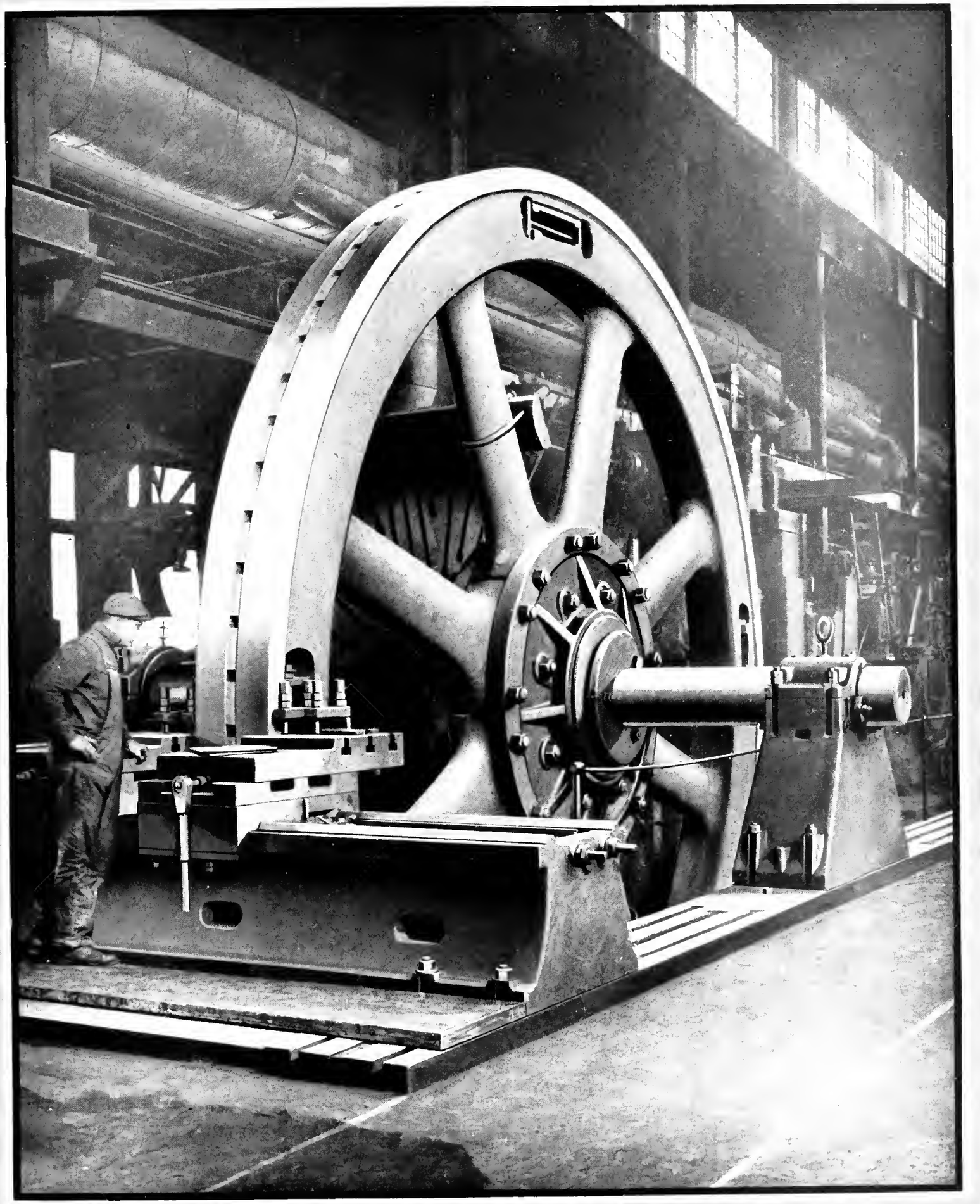
The wheels built up entirely of plates can safely be operated at a peripheral speed of 20,000 feet per minute, and those made of cast steel with plate sides can safely be operated at 16,000 feet per minute.

The wheel as shown in the illustration opposite is of a less expensive construction and can be made of cast iron; when made of cast steel the rim is cast solid with the arms. Steel wheels of this construction can be safely operated at a speed of 13,000 feet per minute and cast iron wheels at 10,000 feet, provided that air furnace melted cast iron is used.

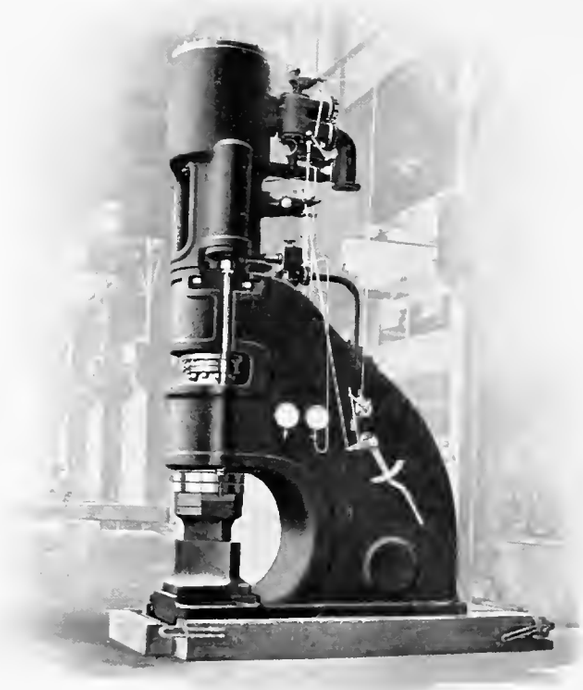
For speeds less than 6000 feet per minute, the usual spoke and rim type of wheel is used, and is made in one piece for diameters up to about 13 feet. For larger diameters the wheels are made in halves or in segments. Such wheels are turned in pit lathes which insures the wheels running true and without vibration.



17′ Cast Iron Flywheel for Motor-Driven Mill



Turning Flywheel in Pit Lathe



250-Ton Mesta Steam-Hydraulic Forging Press
Single Frame Type

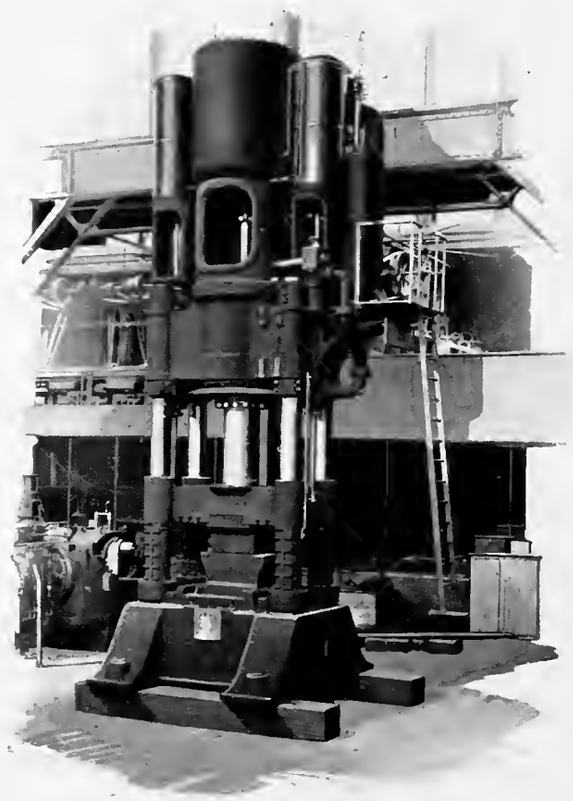
STEAM-HYDRAULIC FORGING PRESSES

THE Mesta Steam-Hydraulic Forging Press has proven to be the most efficient and quickest acting forging press built. These machines are very heavy, are built almost entirely of steel, and have withstood the heavy shocks and rough handling to which they are subjected in the average forge shop.

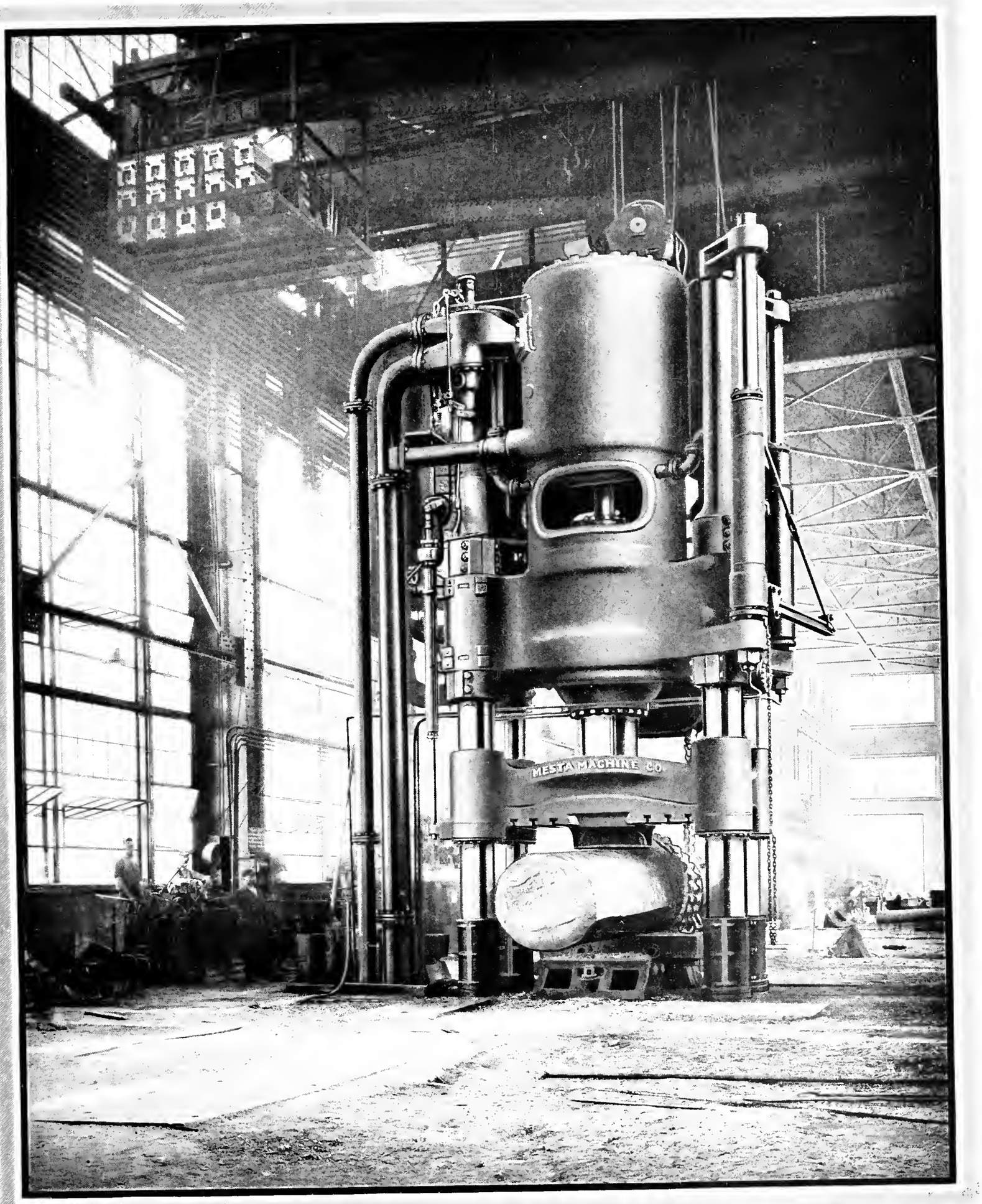
The Mesta Machine Company builds these presses in sizes ranging from 200 tons to 15,000 tons. The smaller sizes are built with a single frame. Sizes from 500 tons up are built in the four-column type. The press is controlled by a single lever located on the floor, where the operator is in direct view of the forging operation. A patented automatic cut-off acts on the valve gear and controls the stroke of the press in direct proportion to the movement of the operating lever by the operator.

During the later war period, when all forging equipment in the United States was taxed to its limit, the Mesta Press proved to be superior to any other type of forging machine. These machines were furnished to the United States Government and also to other concerns doing Government work.

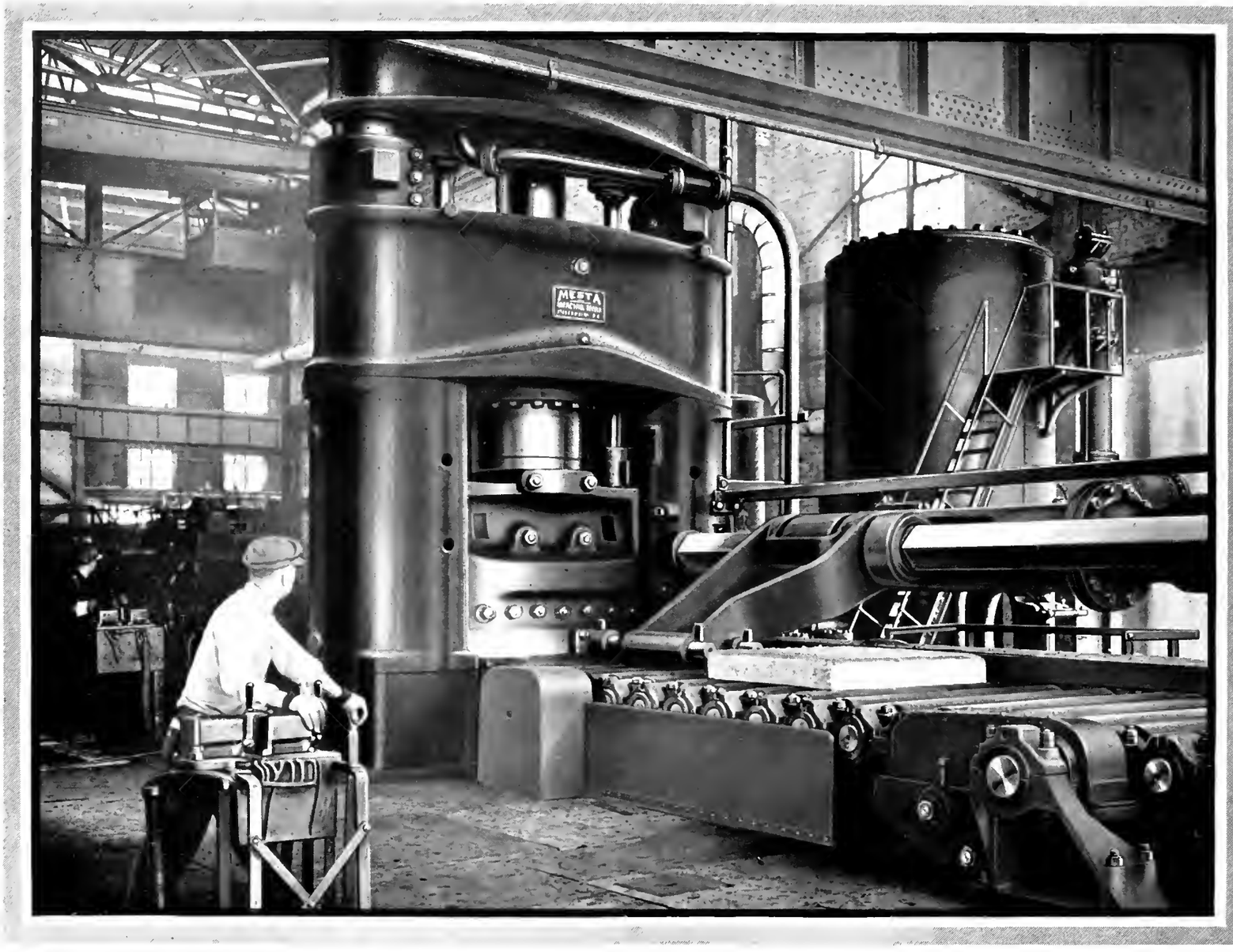
The United States Government in March, 1919, placed an order with the Mesta Machine Company for a forging press with a normal capacity of 14,000 tons for their new Naval Ordnance Plant at Charleston, W. Va. This press, as far as known, will be the largest forging press in the United States.



600-Ton Mesta Steam-Hydraulic Forging Press
Four Column Type



2000-Ton Mesta Steam-Hydraulic Forging Press—Four Column Type



3600-Ton Mesta Steam-Hydraulic Shear Installed at the Gary Works of The Illinois Steel Company

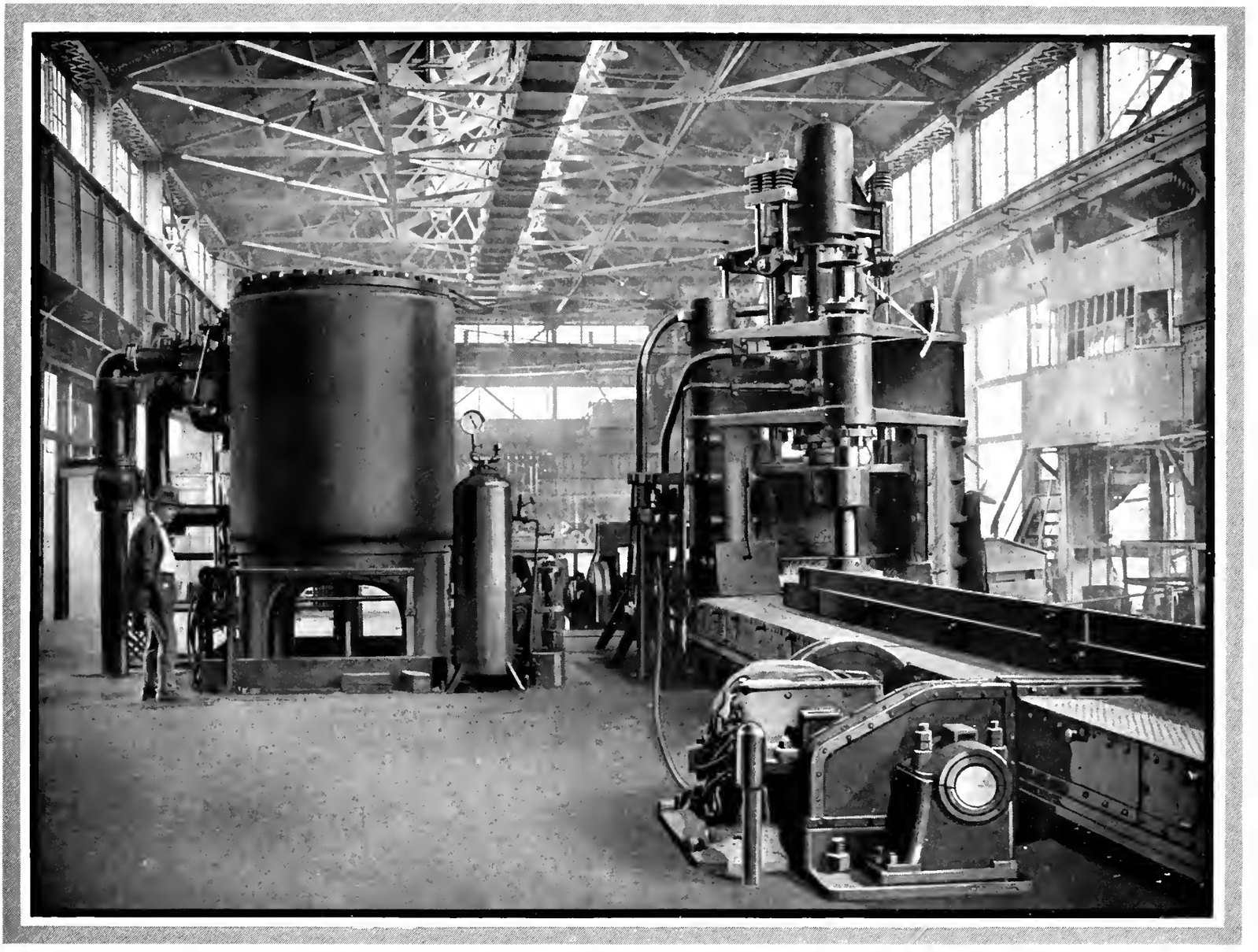
STEAM-HYDRAULIC SHEARS

THE steam-hydraulic principle, so successfully used in forging presses, is also well adapted for shears, especially those used for cutting large sections of steel. The steam-hydraulic shear is self-contained and requires no hydraulic pumps or accumulators.

With this type of shear, the energy required in cutting different thicknesses is in direct ratio with the thickness, while in crank-driven shears the knife is lifted through the whole range at every stroke.

It is also much safer than the crank-driven shear, especially in cutting large sections of hot steel, where the temperature varies, because no damage can be done in attempting to cut a piece which is beyond the capacity of the shear, as the total force exerted cannot be greater than its rated capacity.

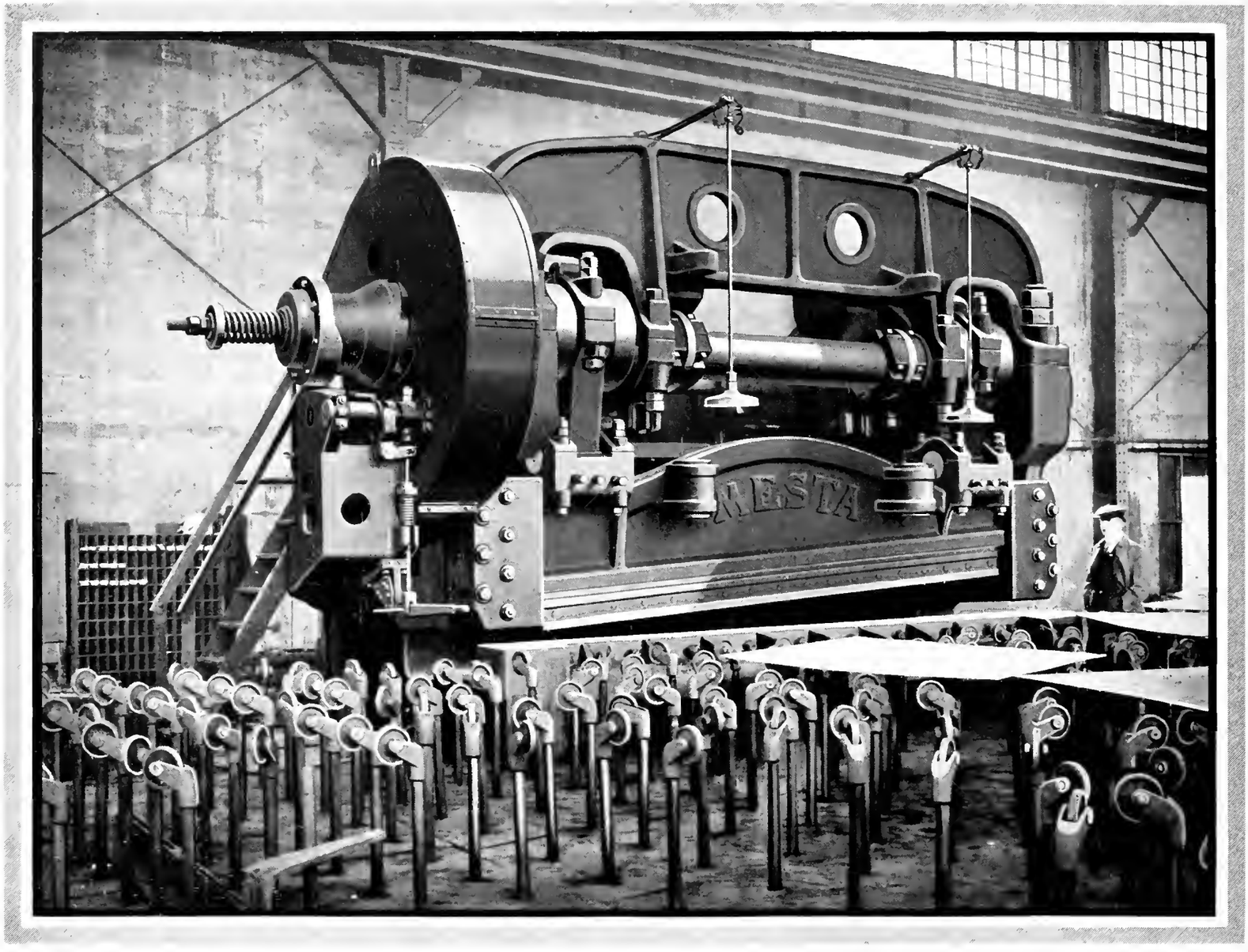
This Company has built these shears in sizes up to 3600 tons, and is prepared to build larger sizes if required.



800-Ton Mesta Steam-Hydraulic Shear Installed at the Lorain Works of The National Tube Company

Mesta Steam-Hydraulic Shears have been particularly successful for cutting heavy slabs and blooms, for several reasons. The steam intensifier is so designed that the steam-driven piston always rests on the water. By this method, voids and subsequent water hammer are eliminated. The shears are operated by a single lever control, equipped with automatic cut-off, so that the shear blade instantly follows the movement of the control lever, and at the end of the cut the blade immediately stops, thus eliminating any shock.

Heavy housings around the tension bolts make the shear very rigid. A hydraulic gag holds the bloom or slab in place and no vibration is perceptible while the piece is being cut. In steel works, these shears are usually located near the heating furnaces, and a very economical method is to use waste heat boilers for furnishing steam.



168" Mesta Motor-Driven Plate Shear Installed at The Inland Steel Company

PLATE SHEARS

MESTA Plate Shears are built in various sizes to suit the product of any plate mill, and range in cutting capacity from $^3/_8$-inch up to 2-inch thickness of plate and for widths up to 200 inches or more.

These shears are of heavy duty construction throughout with all wearing parts amply proportioned to prevent excessive wear. The base, side frames, cross tie, upper knife holder, clutch, gears and other important castings are made of cast steel.

Among the important features in the construction of Mesta Plate Shears may be mentioned the hand-operated stop motion clutch of the double relay type which permits easy handling of the largest as well as the smallest sizes.

For shearing exceedingly heavy plates, where a motor-driven shear would not be practicable, this Company is prepared to furnish Hydraulic Plate Shears or Steam-Hydraulic Plate Shears.

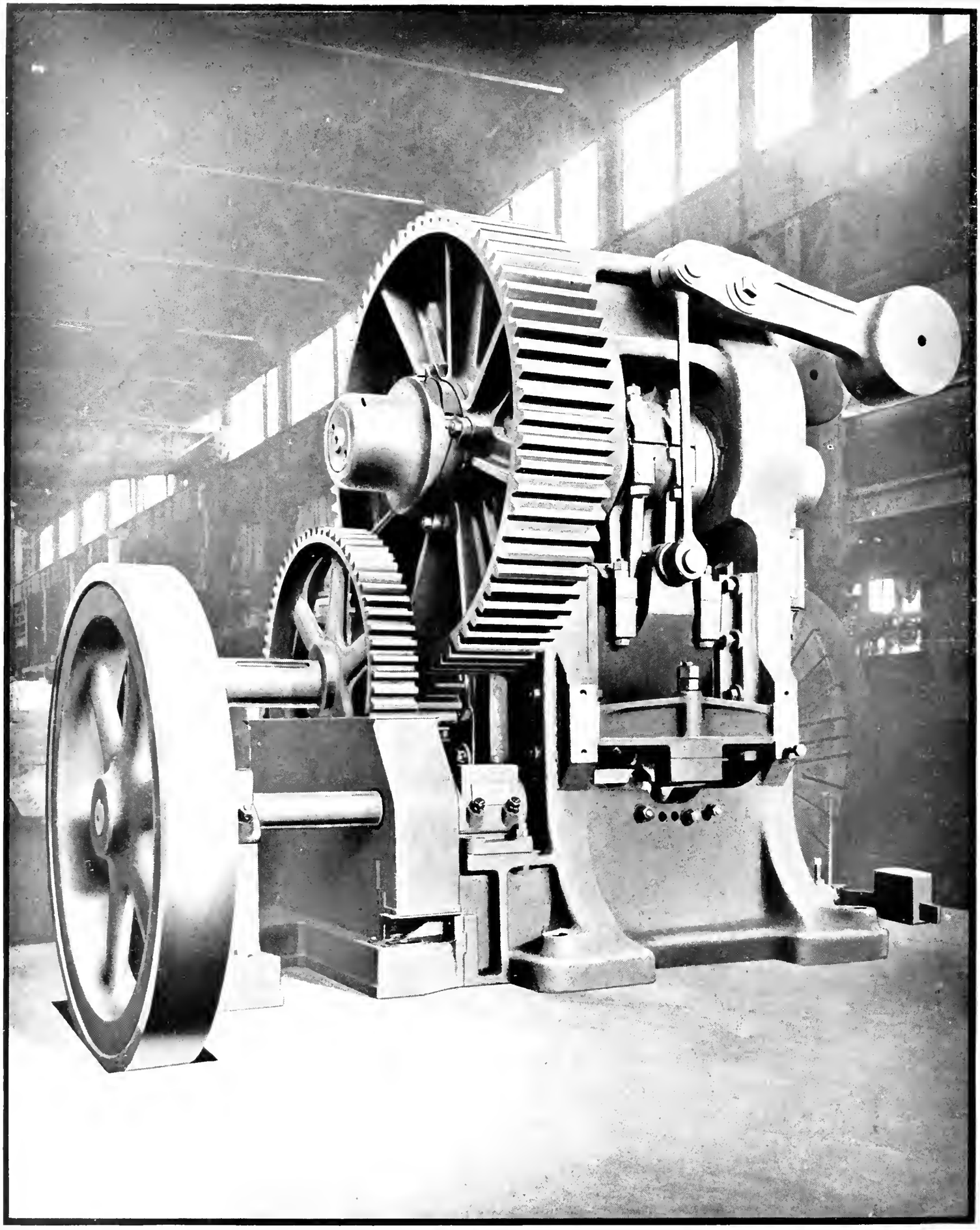
800-Ton Mesta Motor-Driven Bloom Shear Installed at The Central Steel Company

BLOOM SHEARS

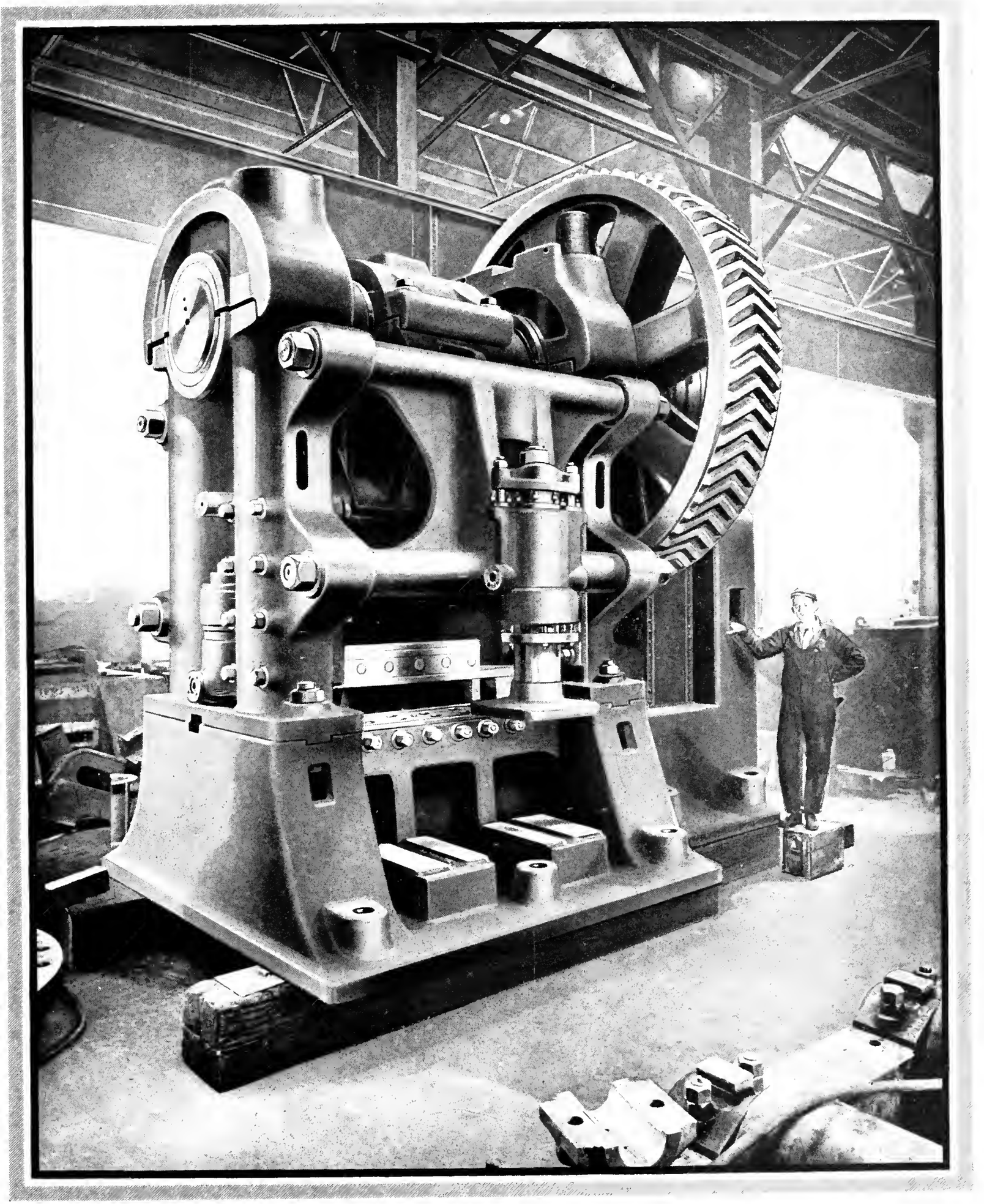
OF all the auxiliary machinery that must be installed in connection with a blooming mill, none is of greater importance than the bloom shear. If for any reason this shear is out of commission, the mill must stop rolling.

Careful attention has, therefore, been given to the design of Mesta Bloom Shears which are of very heavy construction throughout and have ample factors of safety in all parts; resulting in shears that are most reliable in service and that will operate with a minimum cost of maintenance and repair. Above is shown a typical Mesta Motor-Driven Bloom Shear, the heavy construction of which is clearly shown.

These shears are built for cutting any size of blooms, but motor-driven shears are not recommended for blooms exceeding 14 inches square. For larger sizes, hydraulic, or steam-hydraulic shears, as shown on pages 108 and 109, are recommended.



Vertical Guillotine Type Shear for Cutting Cold Steel Bars Up to 6 Inches Diameter



40″x4″ Mesta Motor-Driven Slab Shear Built for The Farrell Works of The Carnegie Steel Company

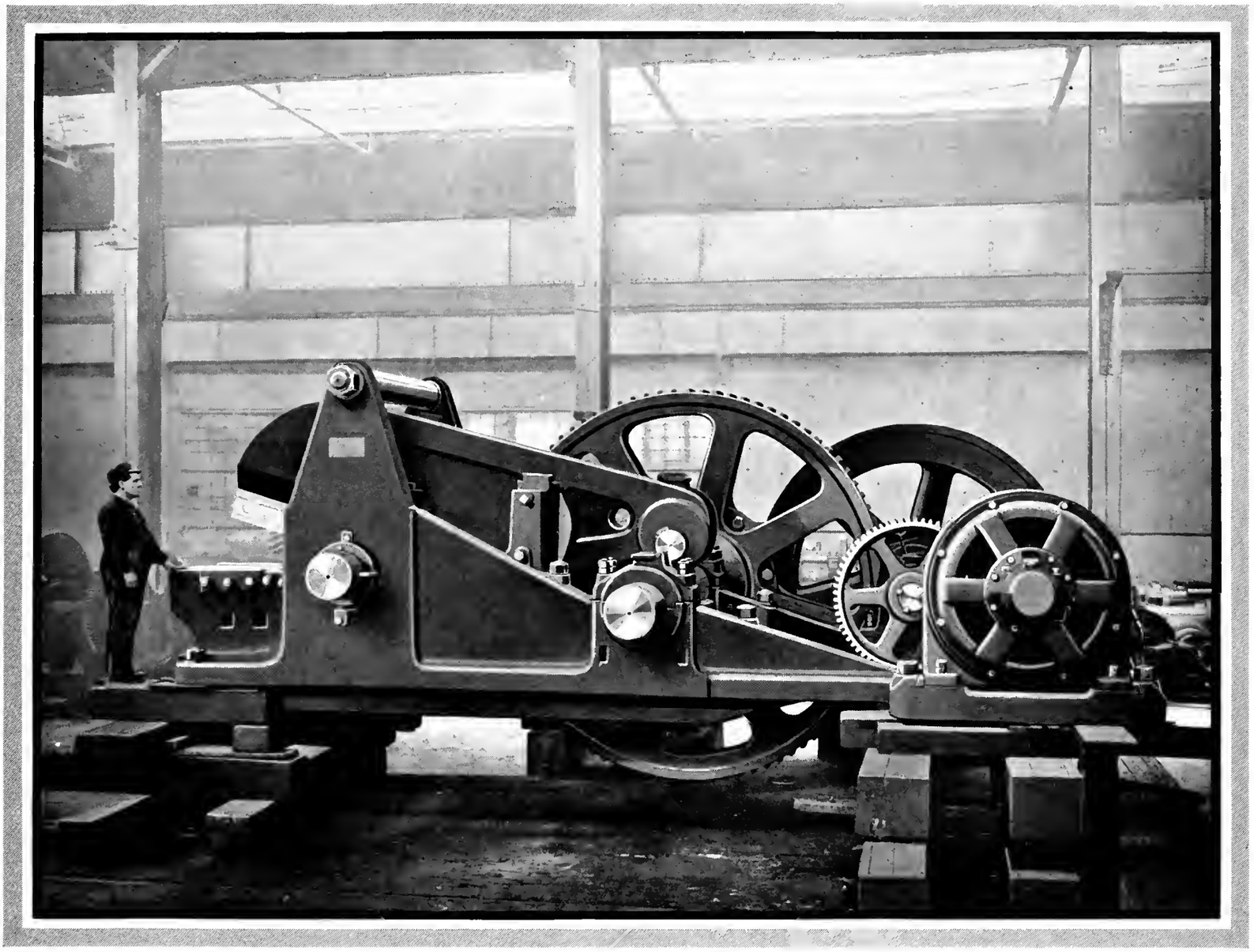
One of Five Mesta Vertical Open Throat Bar Shears Built for the Homestead Works of The Carnegie Steel Company

VERTICAL BAR SHEARS

BAR Shears are either of the guillotine type in which the knife moves centrally between two housings, or of the open throat type in which the knife is overhung. The former type is illustrated on pages 112 and 113 and the latter type is illustrated above.

The open throat type is more accessible, but requires more weight for equal strength than the guillotine type on account of the overhanging frame. The one adopted in any case depends upon the layout of the plant and the material to be cut. If the material can be fed continuously to the shear from the front, the lighter guillotine type is generally used, but if it must come from the side or is of varying section, the open throat shear is to be preferred. Feed rolls and hold-downs are sometimes provided with this type of shear, and gauges when they are desired.

Mesta vertical bar and billet shears are equipped with stop motion clutches.



Low Type Lever Shear for 6½" Cold Steel Bars on Erecting Floor

LEVER SHEARS

MESTA Lever Shears are of very heavy construction throughout, with all pins, shafts and bearing surfaces of ample proportion. For exceptionally heavy service, the bed plate and lever are made of cast steel. Where the material to be cut is of large proportions and cannot be handled quickly, a clutch is provided which will stop the lever at its upper position.

These shears are built in High and Low Types and sizes, ranging in cutting capacity from a 1-inch to a 7-inch square bar of cold mild steel or equivalent sections in rounds, flats and other shapes.

The High Type has the lower knife located above the center line of the main pin and is used where plate scrap is to be sheared. The Low Type has the bottom knife in line with the center line of the main pin and is used where billets, bars, rails and other heavy sections are to be sheared.

Mesta Doubling Shears Assembled Ready for Shipment

DOUBLING SHEARS FOR TIN PLATE

MESTA Doubling Shears for Tin Mill service, as shown in the illustration above, are of very substantial construction throughout with extra long main pin to take care of the stresses caused by the projecting arm, which is attached to the lever and is used for doubling the sheets.

Careful attention has been given to the design throughout in order to properly distribute these stresses and thus eliminate the possibility of breakage and excessive wear. The lever is provided with bronze bushings for bearing on the main pin. The base is of heavy construction and is made of air furnace melted cast iron.

The lever is adjustable so that the knives can be kept in proper alignment; likewise the doubling table and doubling arm, which may be adjusted when necessary.

The usual method of driving the shear is by motor, but belt-driven shears can be furnished when preferred.

Mesta Doubling Shears are built in the usual sizes, namely with knives 36, 38, 40, 42, 44 and 46 inches in length.

SQUARING SHEARS FOR TIN PLATE

MESTA Squaring Shears for Tin Mill service are of heavy and rigid construction, with proper adjustment provided for all wearing parts.

The upper knife, secured to the counterbalanced moving knife block, and the lower knife, secured to the table, are readily adjustable in order to preserve proper alignment.

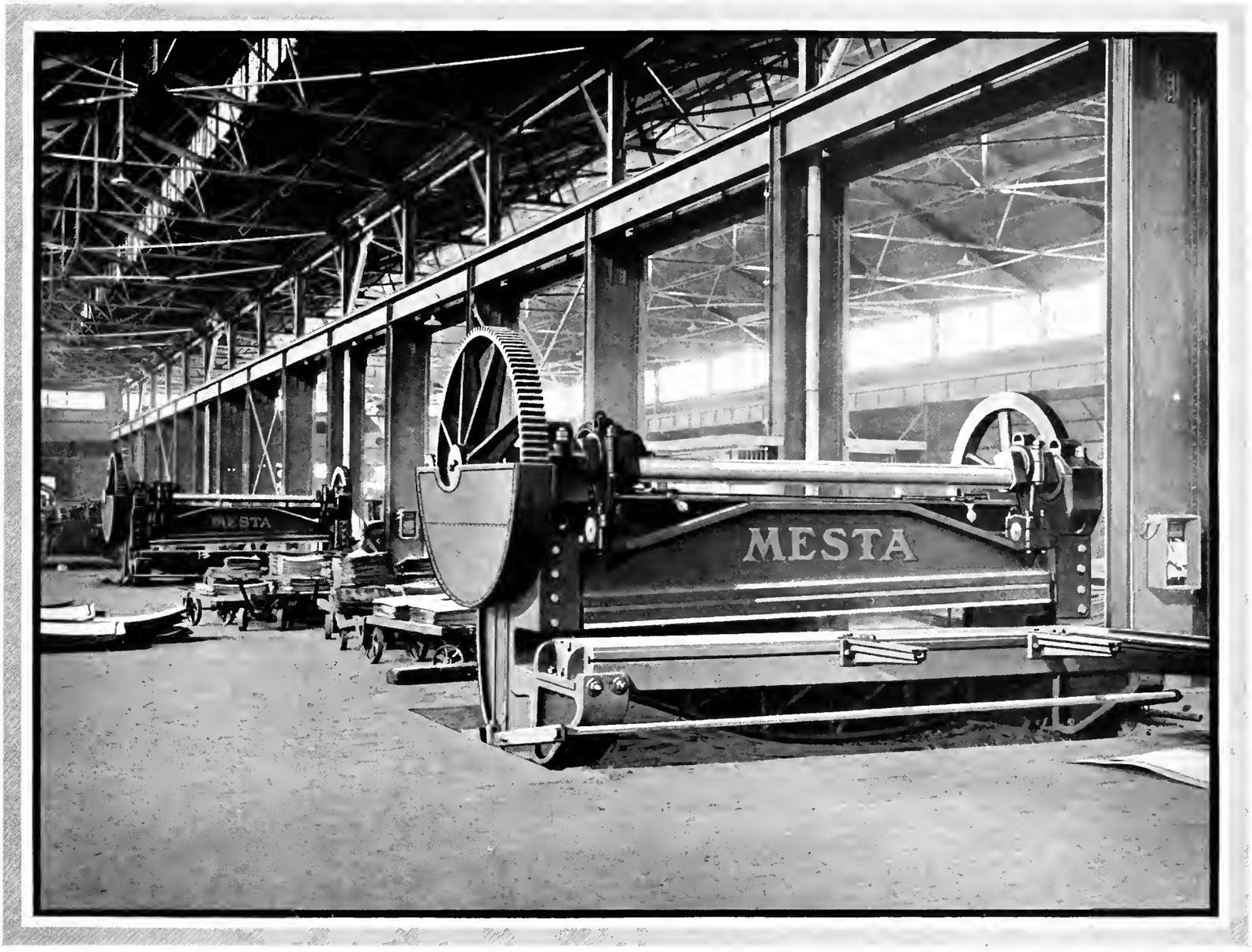
The main frame or shear housings are of rigid construction and cast in a single piece.

A stop motion clutch is provided which is engaged by means of a foot treadle. This clutch automatically stops the shear at its upper position.

The usual method of driving these shears is by belt; several being driven from the same line shaft. When preferred, motor-driven shears can be furnished.

Mesta Squaring Shears are built in the usual sizes, namely with knives 36, 38, 40, 42, 44 and 46 inches in length.

Installation of Mesta Squaring Shears in a Tin Mill



Installation of Mesta Motor-Driven Squaring Shears for Wide Sheets at the Plant of The Trumbull Steel Company

SQUARING SHEARS FOR SHEETS

MESTA Squaring Shears for Sheet Mill service can be furnished in any sizes up to 180 inches in width and to cut up to $\frac{1}{4}$-inch packs. They are of very heavy and rigid construction throughout; the table and moving knife block being of special design to prevent spring and subsequent trouble caused thereby. The moving knife block is counterbalanced so as to take up any lost motion.

The main gear connects with the crank shaft through a stop motion clutch which the operator engages by means of a foot treadle. This clutch automatically stops the moving knife block at its upper position; the motor, countershaft, flywheel and gears operating continuously.

The table is adjustable so that the knives may be kept in proper alignment and guide arms are provided which are readily adjustable for the various sizes of sheets.

Mesta Swinging Frame High Speed Hot Saw

SAWS

WHENEVER rolled material is to be cut without distortion, saws are used in preference to shears.

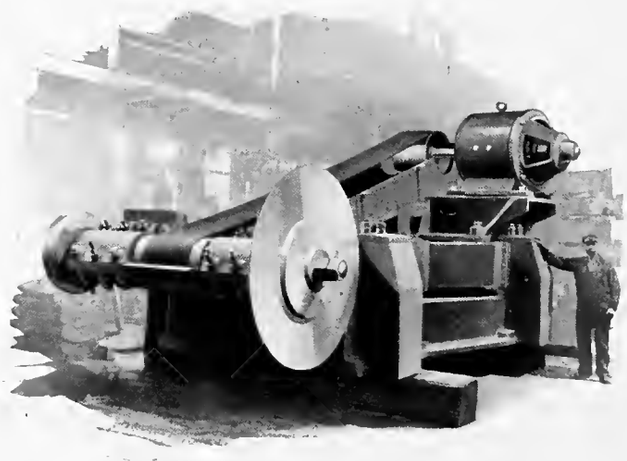
There are two distinct types of saws manufactured, namely, the slow speed and the high speed saw. With the slow speed unit, the peripheral speed of the blade is very slow and is usually provided with separate inserted teeth. The operation is thus more of a machining operation than a cutting operation, as is produced with the high speed saw. Saws for cutting small sections up to 4-inch diameter bars or equivalent sectional areas are generally of the swinging frame type with hand-operated feed, as shown in the above illustration. For larger sections, saws of the sliding frame type as shown below are used.

These saws are equipped with variable speed motor-driven feed mechanism, but for special condition hydraulic, steam or air feed can be furnished.

The Mesta Machine Company builds the High Speed Type of Saw only. With this type of saw the blade is driven through a belt at a very high rate of speed. The peripheral or rim speed varies from 18,000 to 30,000 feet per minute, depending upon whether the material is cut hot or cold. This type of saw has been highly developed after many years' experience until today it is a dependable unit with which little or no trouble is experienced.

For cold sawing, an ordinary flat steel disc is used for a blade, with the edge of the disc nicked or knurled to give the best results. For hot sawing, teeth are cut in the disc. The cutting is extremely rapid and the edges of the material cut are left free from distortion.

Saws are rated by the diameter of the saw blade in conjunction with the size of the motor used for driving the blade. They are built by Mesta in sizes from 36-inch diameter blade with 50 horse power motor up to the largest sizes used.



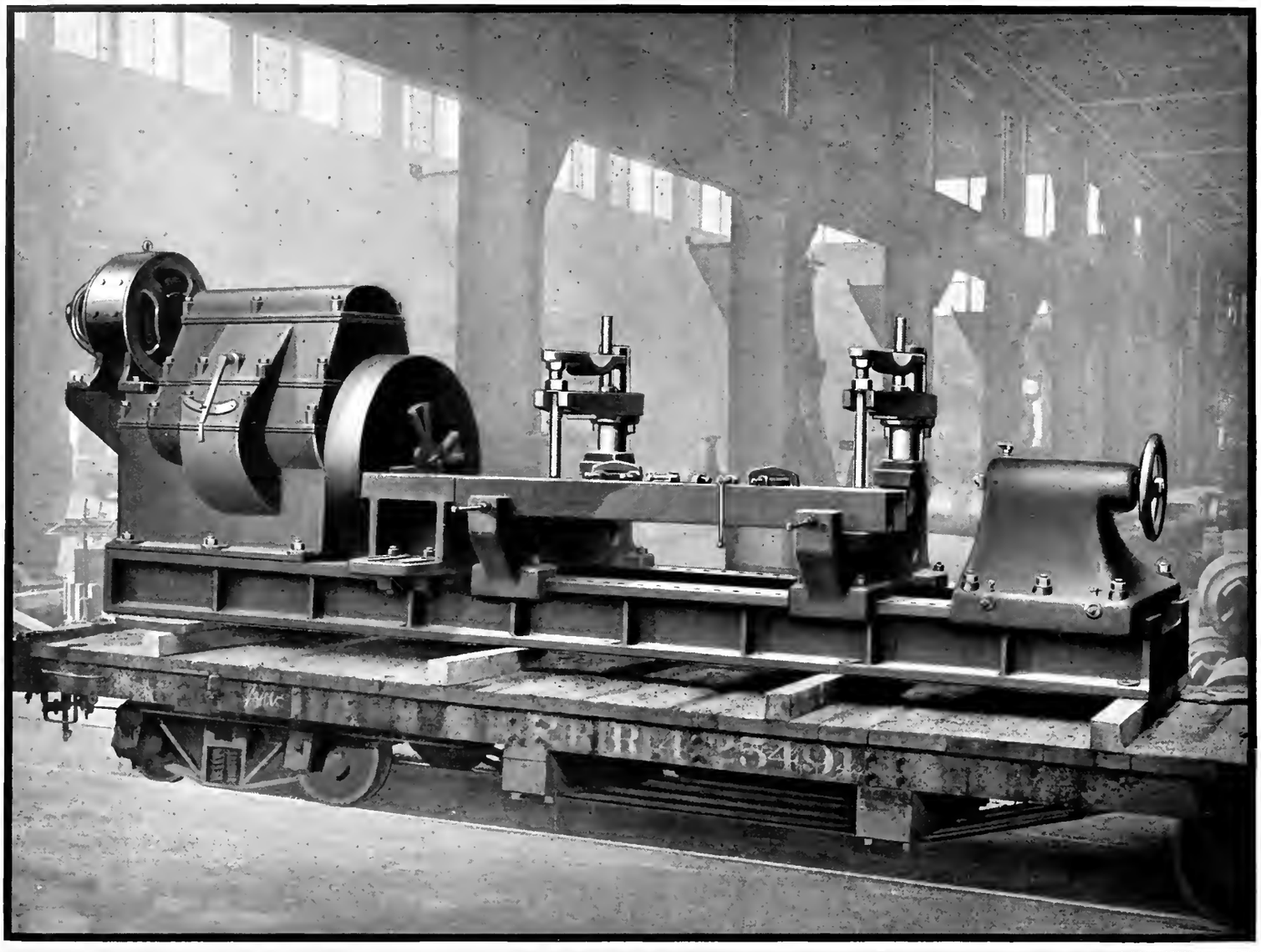
Mesta Sliding Frame High Speed Cold Saw

Installation of Two 54″ Mesta Motor-Driven Sliding Frame High Speed Saws at
The Youngstown Sheet & Tube Company

MESTA Saws are built in sizes ranging from 36-inch diameter blade with 50 horse power driving motor to the largest size required for cutting cold or hot material. These saws are built in two types—the Swinging Frame Type and the Sliding Frame Type.

In the Swinging Frame Type the saw blade is carried in bearings mounted on a swinging frame. This type is largely used for cutting small bars, etc., up to 4 inches in diameter. In the Sliding Frame Type the saw is mounted on a horizontal sliding frame, which also carries the driving motor. For sizes above 4 inches in diameter the sliding frame type is to be preferred.

For cutting small sections a hand feed is generally used. With large sized Swinging Frame Type Saws the feed mechanism is driven either by electric or hydraulic power. Present practice, however, favors operating the feed by an adjustable speed motor.



Motor-Driven Enclosed Headstock Roll Lathe

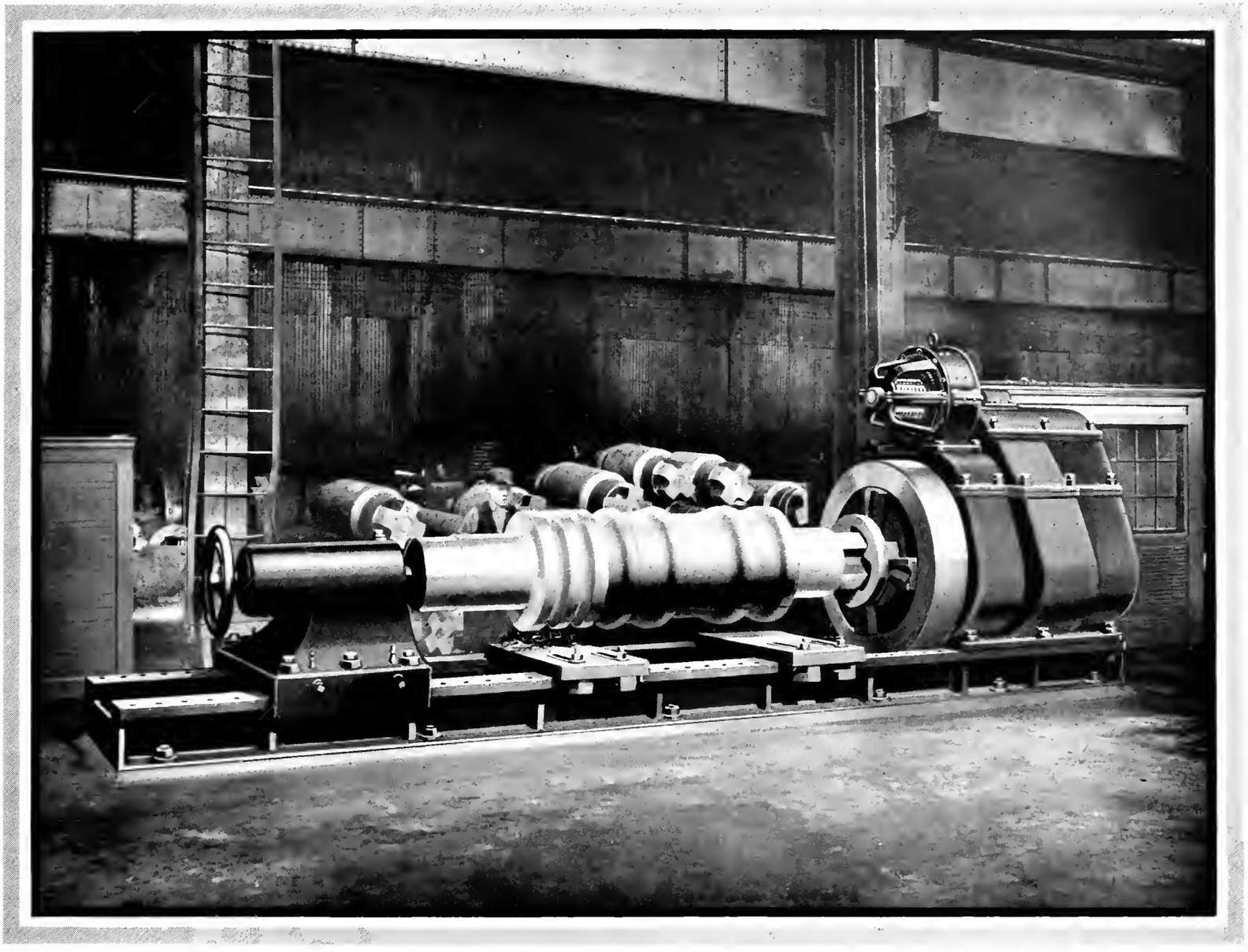
ROLL TURNING LATHES

MESTA Roll Turning Lathes are of the Heavy Duty Type with enclosed headstock.

The very rigid construction permits of the heaviest cuts being taken without vibration or chattering of the tool, and furthermore, permits of cutting speeds not possible with the ordinary type of roll lathe.

The fact that the Mesta Machine Company manufactures rolls for rolling mills and has a large department for the finishing of such rolls, equipped with 28 roll-turning lathes of various sizes, has given exceptional opportunity for the study and development of these machines with the result that the Mesta Roll Lathe stands foremost in this class of equipment.

A variable speed motor, usually of 3 to 1 ratio, is used to drive these lathes which, in addition to a set of change gears operated by a hand lever, permits of a wide range of turning speeds.



Installation of a No. 4 Motor-Driven Enclosed Headstock Roll Lathe

All gearing, including the face plate, is made of cast steel, with the exception of the small pinions, which are made of forged steel. The teeth in all gears and pinions, including the internal teeth in the face plate, have machine-cut teeth.

The reduction gears are entirely enclosed in the headstock and run in an oil bath. The design of the headstock is such that all gears and shafts are readily accessible and all bearings are amply proportioned so as to provide for the heavy pressure encountered during the cutting operation.

The bed plate is of extra heavy box construction to insure the strength and rigidity necessary.

Mesta Roll-Turning Lathes are built in five sizes, namely, 20-inch, 28-inch, 36-inch, 40-inch and 50-inch; these dimensions being the clear swing over the necking and piano rests. The length of bed is made to suit the maximum length of roll to be turned.

Blooming Mill Roll with Universal Type Coupling

ROLLS

THE Mesta Machine Company has been engaged in the design and manufacture of rolls for the past thirty years, having the distinction of being the first in the United States to manufacture chilled iron hot and cold rolls for use in tin plate mills.

The experience gained during this time and the excellent facilities provided for the manufacture of rolls, mainly accounts for this Company's unqualified success along this line.

This Company manufactures all classes of rolls used in rolling mills for rolling iron, steel, brass, copper, lead, zinc, aluminum, etc., which embraces chilled cast iron rolls, known as "Chilled Rolls;" sand cast iron rolls known as "Sand Rolls;" Chilled Pass iron rolls where one or more passes in the roll are chilled; Cast Steel rolls; Forged Steel rolls; Alloy Steel rolls; and the well-known "Mesta Special" roll.

Generally speaking, the strength of a roll varies inversely with the hardness of the material of which it is made; the chilled roll being the hardest, and the steel roll the strongest. The "Mesta Special" roll is made of a special alloy mixture, carefully heat treated. This roll combines both strength and hardness and is being used with excellent success in mills in which sand and steel rolls were formerly used. Actual records have shown "Mesta Special" rolls to give more than three times the service of other rolls before being redressed, which not only effects a saving in the cost of rolls and in the cost of redressing, but also reduces considerably the delay in the operation of the mill caused by the changing of rolls. The result is increased output for that mill and a lower cost of production.

Where the question of strength, rather than wearing qualities, must be given primary consideration, Mesta cast or forged steel and alloy steel rolls will be found most satisfactory. These rolls are made of acid open hearth steel and carefully annealed to remove any internal stresses.

Mesta chilled rolls are produced with a chill that is uniform in quality and of the proper hardness to suit the conditions of the mill and the material to be rolled; being especially adapted for sheet mills and plate mills where a high surface finish is desired.

Group of Rolls Ready for Shipment

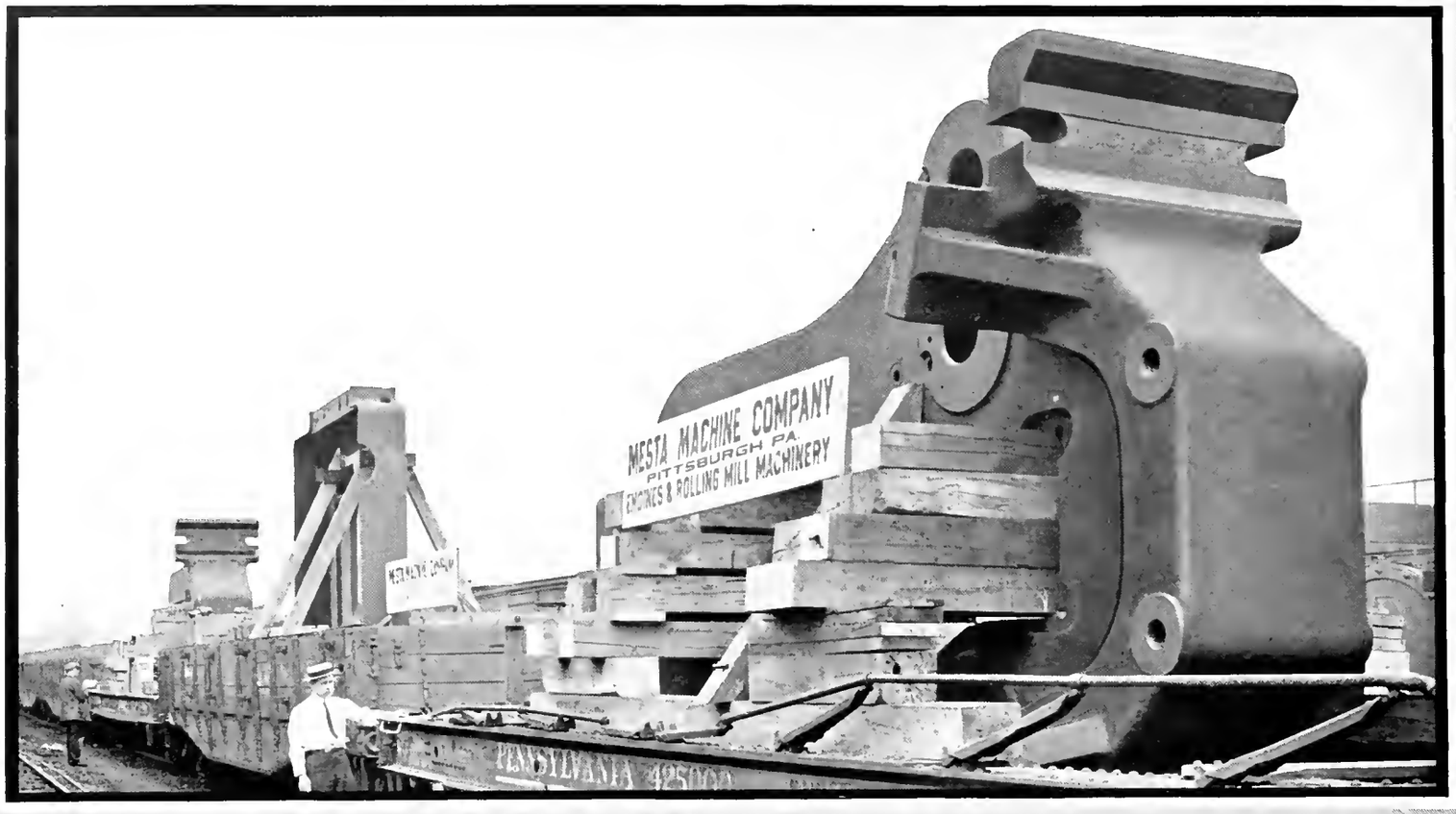
44″x160″ Chilled Iron Plate Mill Roll

There are a number of roll manufacturers in the United States who can furnish chilled rolls of medium size, but there are very few who are in a position to furnish large chilled rolls.

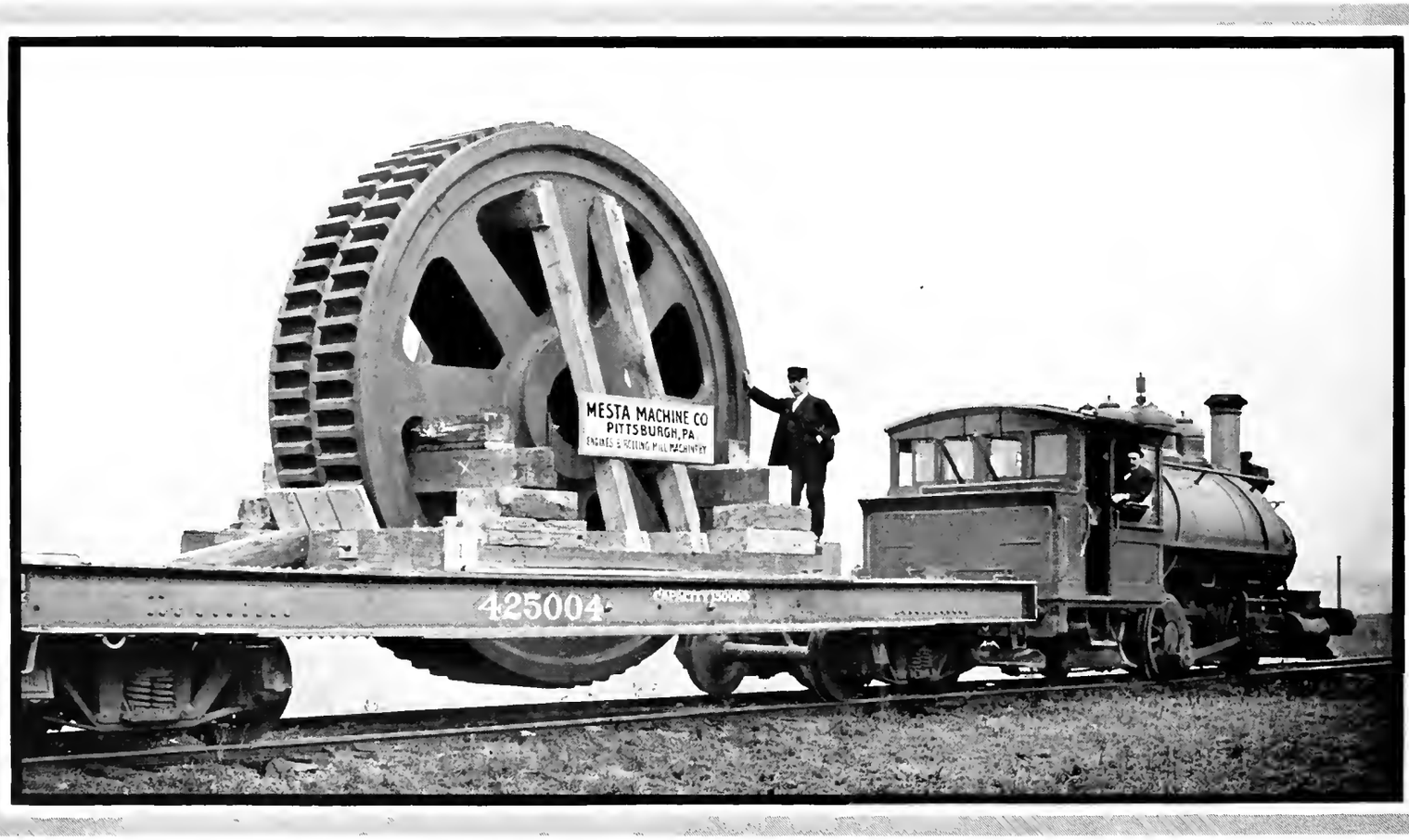
The Mesta Machine Company has kept pace with the demand for large chilled rolls and is in a position to furnish any size up to the largest required.

The above illustration shows a large chilled plate mill roll, the body of which is 44 inches diameter and 160 inches long, being one of a number of rolls of this size which were made by this Company for one of the largest mills in the United States. The finished weight of this roll is 81,000 pounds and the weight of metal to pour it, including the sinkhead, was 100,000 pounds.

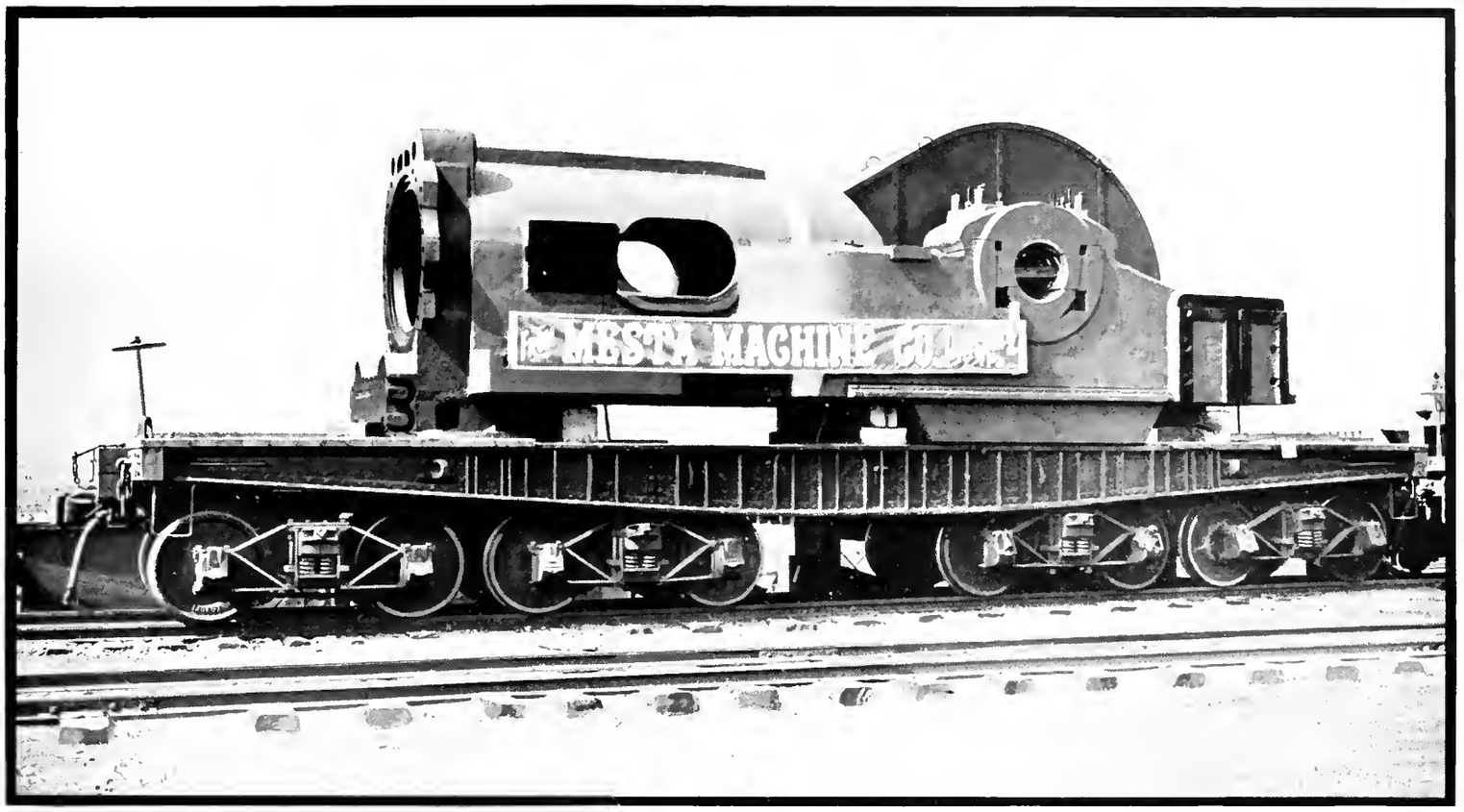
This Company has also manufactured for export a number of chilled plate mill rolls having a diameter of 44 inches and body length of 145 inches.



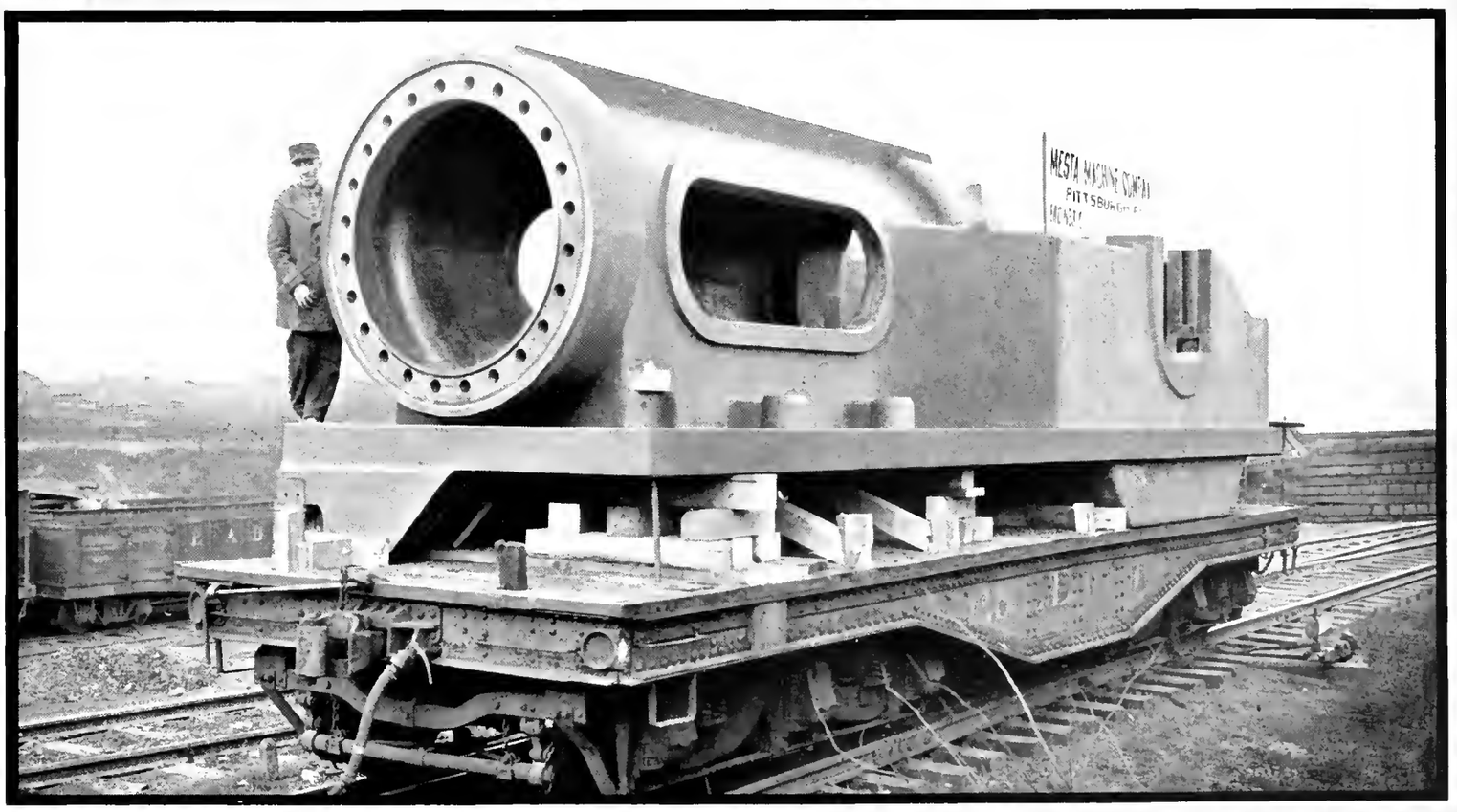
Blooming Mill Housing. Shipping Weight, 180,000 Pounds



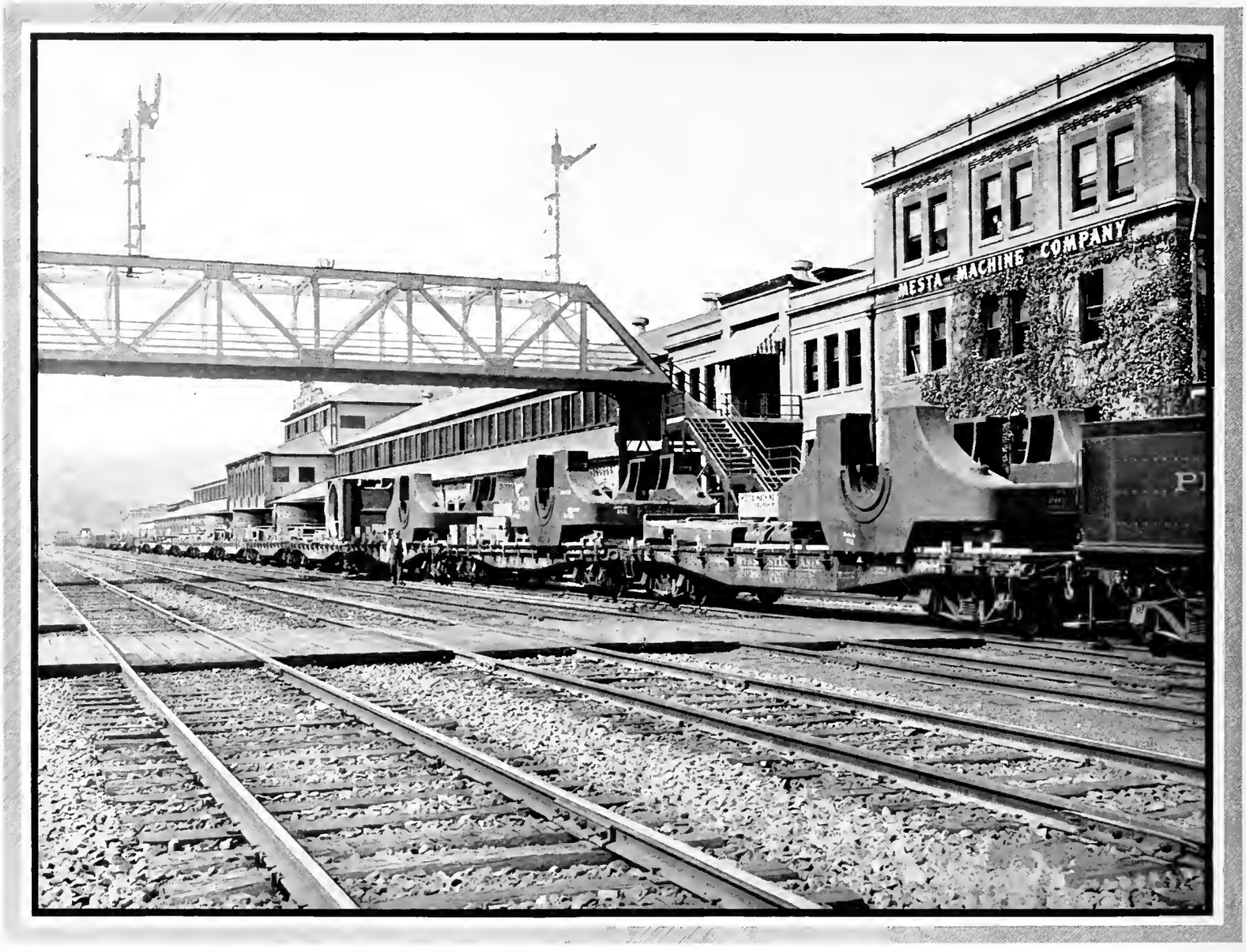
Machine-Molded Staggered Tooth Gear. Shipping Weight, 105,000 Pounds



Reversing Engine Bedplate. Shipping Weight, 150,000 Pounds



Reversing Engine Bedplate. Shipping Weight, 220,000 Pounds



Shipment of Three Vertical Long Crosshead Type Blowing Engines for Export

THE above illustration shows a shipment of three Long Crosshead Blowing Engines leaving the plant of the Mesta Machine Company in one train, consisting of sixteen cars, for New York City, where they were loaded on a boat for Australia.

These engines were built for the Broken Hill Proprietary Company of Australia, and consisted of one low pressure engine with steam cylinder 84 inches in diameter, air cylinder 84 inches in diameter by 60-inch stroke, and two high pressure engines with steam cylinders 48 inches in diameter, air cylinders 84 inches in diameter by 60-inch stroke.

The Mesta Blowing Engines were selected for this plant, principally on account of the simplicity and durability which can only be found in the Mesta Blowing Engines, equipped with their Patented Automatic Plate Valves for the air cylinders.

INDEX

The Caxton Company
Cleveland